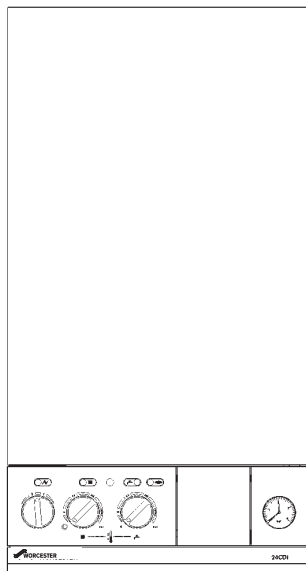


# 24CDi OF

WALL MOUNTED COMBINATION BOILER FOR CENTRAL HEATING  
AND MAINS FED DOMESTIC HOT WATER

## INSTALLATION AND SERVICING INSTRUCTIONS



GC NUMBER 47 311 32 (N.G.)  
GC NUMBER 47 311 33 (L.P.G.)



*Worcester Bosch Group supports  
the Benchmark code of practice*

### BOILER OUTPUT

Automatic Modulating Control

To Domestic Hot Water and Central Heating

Minimum 9.0 kW

Maximum 24.0 kW

**IMPORTANT: THESE INSTRUCTIONS APPLY IN THE UK ONLY**  
**THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE GAS METER**

**This appliance must be installed by a competent person in accordance  
with the Gas Safety (Installation and Use) Regulations 1998**

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## 1. Installation Regulations

1.1 Gas Safety (Installation & Use) Regulations 1998 (Amended 1998) : It is the law that all gas appliances are installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your interest, and that of safety, to ensure compliance with the law.

1.2 The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

1.3 The compliance with a British Standard or European Norm does not, of itself, confer immunity from legal obligations.

1.4 The installation of the appliance must be in accordance with the relevant requirements of the Gas Safety Regulations, current IEE Regulations, Building Regulations, Building Standards (Scotland) and local water bye-laws.

1.5 The installation should follow the recommendations of the following British Standards unless otherwise indicated:

BS6798 - Specification for the installation of gas fired hot water boilers of rated input not exceeding 60kW (Gross).

BS5449 - Central heating for domestic premises.

BS5546:1 - Installation of gas hot water supplies for domestic purposes.

BS5440/1 - Flues and ventilation for gas appliances of rated input not exceeding 60kW (Gross): Flues.

BS5440/2 - Flues and ventilation for gas appliances of rated input not greater than 60kW (Gross): Air supply.

BS 5482 - Domestic butane and propane gas burning installations - permanent dwellings.

BS6891 - Installation of low pressure gas pipework installations upto 28mm (R1).

BS6700 - Domestic water supply in buildings.

BS7593 - Water treatment in domestic heating systems.

1.6. To ensure that the installation will perform to the highest standards, the system and components should conform to any other relevant standards.

1.7. The appliance and/or components conform, where applicable, with the Essential Requirements of the Gas Appliance Directive, the Boiler Efficiency Directive, the EMC Directive and the Low Voltage Directive.

1.8. In accordance with the requirements of COSHH the appliance does not contain any substances which are harmful to health.

1.9. Product Liability regulations indicate that, in certain circumstances, the installer can be held responsible, not only for mistakes on his part but also for damage resulting from the use of faulty materials. We advise that, to avoid any risk, only quality approved branded fittings are used.

1.10. LPG Installation. The appliance shall not be installed in a room or internal space below ground level when it is intended for use with LPG. This does not preclude the installation into rooms which are basements with respect to one side of the building but open to the ground on the opposite side.

1.11. The advice and instructions given in this document covers, as

far as possible, the foreseeable situations which may arise. Contact Worcester Heat Systems Technical Department, Telephone: 08705 266241, for advice on specific installations.

## 2. General Information

### 2.1. General Information

2.1.1. The appliance is set to give a maximum output of 24kW to the domestic hot water and to the heating system. The hot water flow rate is limited to a nominal 9 l/min at a maximum temperature rise of 40°C.

2.1.2. The sanitary water section of the appliance is suitable for water mains pressures of upto 10bar.

2.1.3. Conversion kits are available to convert the appliance from Natural Gas to Propane operation and vice versa. The kits include conversion instructions.

### 2.2 Electrical Supply

Mains supply: 230V ~ 50 Hz. 140Watts.

External fuse: 3A (BS 1362). Internal fuses: T 2A (F1), and T 1.25A (F2).

### 2.3 Gas Supply

Check the data plate (located on the inner cover of the appliance) to ensure the appliance has been set up for the correct gas supply. The appliance can be set up for either of the following gases: Natural gas (G20) or Propane (G31). **A conversion kit including instructions is available to change the appliance from one gas to the other.**

The boiler requires 2.9m<sup>3</sup>/h (100ft<sup>3</sup>/hr) of natural gas (G20) or 1.13m<sup>3</sup>/hr (38.8ft<sup>3</sup>/hr) of propane gas (G31). The gas meter and supply pipes must be capable of supplying this quantity of gas in addition to the demands of any other appliances being served.

The meter governor or regulator should deliver a dynamic pressure of 20mbar (8in wg) for natural gas or 37mbar (14.4 in wg) for propane at the appliance, which is about 18.5mb or 35.5 mbar at gas valve inlet pressure test point.

The complete installation, including the gas meter, must be tested for soundness and purged. Refer to BS 6891.

### 2.4 Packing

The appliance and flue components are packed in separate cartons.

### 2.5 Installation

The appliance is suitable for indoor installations only.

An open vent feed pipe assembly kit is available.

A wall-spacing frame to allow pipe runs behind the appliance is available.

An inlet water filter is fitted to the mains cold water inlet on the appliance.

The appliance is fitted with a system filling link assembly. See Page 8.

The appliance is suitable for connection to a sealed or open vented primary system.

The specified ventilation openings made into a wall or compartment door must not be obstructed.

If the appliance is to be fitted into a compartment then the compartment must conform to the requirements of BS 5440:2:1989.

Do not place anything on top of the appliance.

The clearances specified for servicing must be maintained.

Refer to Fig. 2.

## 2.6 Flue

The flue must be generally vertical and have no horizontal runs.

The flue must end with a BG plc approved terminal.

## 2.7 Controls

The ON/OFF switch will turn the mains electricity on and off at the appliance.

The electronic control system and gas valve modulate the heat input in response to the central heating and domestic hot water temperature settings.

The Central Heating Temperature control knob provides for the selection of domestic hot water only (turned fully anti-clockwise) or central heating and domestic hot water (turned clockwise).

The position of the Domestic Hot Water control knob will determine the temperature of the water delivered to the tap or shower or bath.

A fascia mounted programmer is available as an optional extra. A remote mounted programmer may be connected to the appliance.

The integral fascia displays indicate the status of the appliance.

There is provision for the connection of a mains voltage room thermostat and/or a frost thermostat.

The electronic controls prevent rapid cycling of the appliance in the central heating mode.

## 2.8 System Notes

### IMPORTANT

**Check that no dirt is left in either the gas or water pipework as this could cause damage to the appliance. Thoroughly flush the heating system and the cold water mains supply in accordance with the recommendations of BS7593: 1992.**

The water pipe connections throughout a sealed system must be capable of sustaining a pressure of up to 3 bar.

Radiator valves must conform to the requirements of BS 2767:1991.

The relief valve discharge must be directed away from any electrical components or where it would cause a hazard to the user.

A drain cock to BS 2879 must be fitted to the lowest point of the system.

For circuit design purposes it is important that due note is taken of the information given in Table 3 relating to the available pump head.

## 2.9 Showers, Bidets, Taps and Mixing Valves

Hot and cold taps and mixing valves used in the system must be suitable for operating at the mains pressure.

Thermostatically controlled shower valves will guard against the flow of water at too high a temperature.

If a pressure equalising valve is used, set the Domestic Hot Water temperature control knob to the 'MAX' position.

Hot and cold mains fed water can be supplied direct to an over-rim flushing bidet subject to local Water Company requirements.

With all mains fed systems the flow of water from the individual taps will vary with the number of outlets operated simultaneously and the cold water mains supply pressure to the property. Flow balancing using 'Ball-o-Fix' type valves is recommended to avoid an excessive reduction in flow to individual outlets. For further information contact Worcester Heat Systems Technical Helpline.

## 2.10 Safety Considerations

The appliance must not be operated in a waterless condition.

The appliance must not be operated with the boiler inner casing cover removed.

Work must not be carried out on the appliance without the gas and electricity supplies being switched off.

Checks must be made to ensure that, where applicable, the ventilation openings made into walls and partitions are of the

correct size and are not obstructed.

**IMPORTANT: Where back-flow prevention devices, including water meters, are fitted the expansion of hot water into cold water main can be prevented. This can result in a pressure build-up that may cause damage to the boiler and household devices such as showers, washing machines etc.**

**In these cases we recommend that a mini-expansion vessel be fitted adjacent to the boiler in the cold water pipe.**

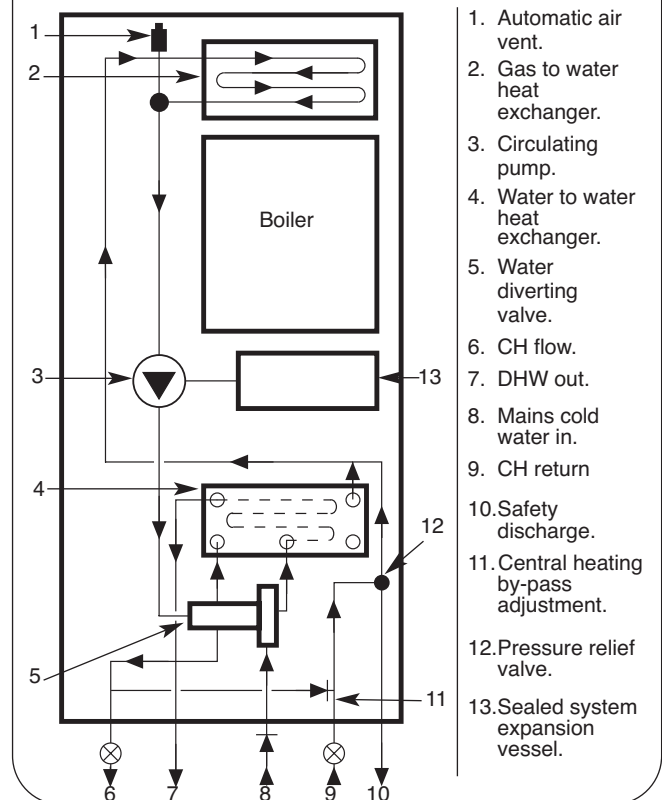
## 2.11 Operation

**Domestic Hot Water:** With a demand for hot water the burner will light at its maximum setting and then automatically adjust its output to maintain the temperature of the delivered water. When hot water is no longer required, the burner will extinguish. The fan and pump may continue to run for a short period to dissipate the residual heat from the appliance.

**Central Heating:** With a demand for heating the burner will light at its minimum setting and gradually increase to give the maximum output. The output of the appliance is then automatically adjusted to maintain the temperature of the system. The output can reduce down to a minimum of 11.9 kW. If the system no longer requires even the minimum output to maintain the desired room temperature the burner will extinguish. The fan and pump may continue to run to dissipate the residual heat from the appliance. The appliance will remain off for a fixed period of three minutes before re-lighting to automatically meet the system requirements.

**Domestic Hot Water and Central Heating:** The appliance will supply heat to the central heating system as required. A demand for domestic hot water at a tap or shower will override the central heating requirement for the period of the domestic hot water demand. When hot water is no longer required the appliance will return to the central heating state and its normal mode of operation.

**Fig. 1. Appliance water flow diagram.**



1. Automatic air vent.
2. Gas to water heat exchanger.
3. Circulating pump.
4. Water to water heat exchanger.
5. Water diverting valve.
6. CH flow.
7. DHW out.
8. Mains cold water in.
9. CH return
10. Safety discharge.
11. Central heating by-pass adjustment.
12. Pressure relief valve.
13. Sealed system expansion vessel.

### 3. Technical Data

Table 1.

NOMINAL BOILER RATINGS (10 Minutes After Lighting)								
BOILER ADJUSTED FOR G20 (Natural Gas)								
	OUTPUT		INPUT (Net)		BURNER SETTING PRESSURE		GAS RATE	
	kW	Btu/h	kW	Btu/h	m bar.	in. wg.	m <sup>3</sup> /h	ft <sup>3</sup> /h
DHW	9.0	30,700	10.4	35,500	2.0	0.8	1.1	37.8
CH	11.9	40,600	13.8	47,100	3.5	1.4	1.46	51.5
MAX	24.0	81,900	27.0	92,100	13.2	5.3	2.9	100.0
BOILER ADJUSTED FOR G31 (Propane)								
DHW	9.0	30,700	10.4	35,500	5.5	2.2	0.42	14.4
CH	11.9	40,600	13.8	47,100	7.2	2.9	0.58	20.5
MAX	24.0	81,900	27.0	92,100	35.5	14.4	1.13	38.8

**Note:** Gross Heat Input x 0.901 (NG) or x 0.922 (propane) = Net Heat Input.

Table 2.

FLUE DETAILS		
	mm	inches
FLUE ASSEMBLY DIAMETER	125	5

Table 3

PUMP HEAD						
BOILER OUTPUT		HEAD		MIN. FLOW RATE		FLOW/ RETURN DIFFERENTIAL °C    °F
kW	Btu/h	Metres	Feet	L/min.	Gal/Min.	
9.0	30,700	4.8	15.7	11.7	2.57	11°C    20°F
24.0	81,900	2.0	6.6	20.5	4.5	12.5°C    22°F

Table 4

MECHANICAL SPECIFICATIONS	
CENTRAL HEATING FLOW - COMPRESSION	22mm
CENTRAL HEATING RETURN - COMPRESSION	22mm
COLD WATER INLET - COMPRESSION	15mm
DOMESTIC HOT WATER FLOW - COMPRESSION	15mm
GAS INLET	Rp ¾
RELIEF VALVE DISCHARGE - COMPRESSION	15mm
CASING HEIGHT	850mm
CASING WIDTH	450mm
CASING DEPTH	360mm
WEIGHT - DRY	45kg
WEIGHT - MAXIMUM INSTALLATION	42kg
WEIGHT - PACKAGED	48kg

Table 5

PERFORMANCE SPECIFICATIONS		
PRIMARY WATER CAPACITY	2.0 litres	
MAXIMUM MAINS INLET PRESSURE	10 bar	
MINIMUM MAINS INLET PRESSURE (working) for max. hot water flow	1.2 bar	
MINIMUM MAINS INLET PRESSURE (working) to operate appliance	0.7 bar	
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE	82°C nom	
MAXIMUM CENTRAL HEATING SYSTEM SET PRESSURE	1.5 bar	
DOMESTIC HOT WATER TEMPERATURE RANGE	50 - 62°C	
OUTPUT TO DOMESTIC HOT WATER	NATURAL GAS (G20)	9.0 - 24 kw
	LPG - PROPANE (G31)	9.0 - 24 kw
OUTPUT TO CENTRAL HEATING	NATURAL GAS (G20)	11.9 - 24 kw
	LPG - PROPANE (G31)	11.9 - 24 kw
DOMESTIC HOT WATER SPECIFIC RATE AT 30° RISE	12.4 l/min	
MAXIMUM DOMESTIC HOT WATER FLOW RATE FROM APPLIANCE AT 40° RISE	9.0 l/min	
NOx CLASSIFICATION	Class 3	
SEDBUK*	78.1	BAND D

\*The value is used in the UK Government Standard Assessment Procedure (SAP) for the energy rating of dwellings. The test data from which it has been calculated have been certified by the Gastec notified body.

Table 6

DOMESTIC HOT WATER - TEMPERATURE RISE				
DISCHARGE RATE l/min	7	8	9	10
TEMPERATURE RISE °C	49	42.9	38.1	34.3

Table 7

GAS SUPPLY SYSTEM - BASED ON NG (G20)			
TOTAL LENGTH OF GAS SUPPLY PIPE meters			
3	6	9	
GAS DISCHARGE RATE m <sup>3</sup> /h		PIPE DIAMETER mm	
8.7	5.8	4.6	22
18.0	12.0	9.4	28

Table 8

	CLEARANCES (mm)	
	INSTALLATION	SERVICE
ABOVE APPLIANCE	300	300
IN FRONT OF APPLIANCE	600	600
BENEATH APPLIANCE *	900	200
RIGHT AND LEFT HAND SIDE	10	10

\*Refer to Section 4.6

Table 9

SYSTEM CAPACITY WITH A 10 LITRE VESSEL			
TOTAL SYSTEM VOLUME litres			
INITIAL PRESSURE bar	INITIAL CHARGE PRESSURE bar		
	0.5	1.0	1.5
1.0	72	92	n/a
1.5	39	53	64

## 4. Siting The Appliance

4.1 The appliance must not be installed in any room containing a bath or shower or in a bedroom or bed-sitting room.

Particular attention is drawn to the requirements of the current I.E.E. Wiring Regulations and, in Scotland, the electrical provisions of the Building Regulations applicable in Scotland.

4.2 The appliance is not suitable for external installation.

4.3 The appliance does not require any special wall protection.

4.4 The wall must be capable of supporting the weight of the appliance. See Table 4.

4.5 The following clearances must be available for installation and for servicing. See Fig. 2.

4.6\* The appliance should have a minimum clearance of 900mm between the bottom of the appliance and the floor.

4.7 The appliance can be installed in a cupboard used for airing clothes provided that the requirements of BS 6798 and BS 5440:2 are strictly followed.

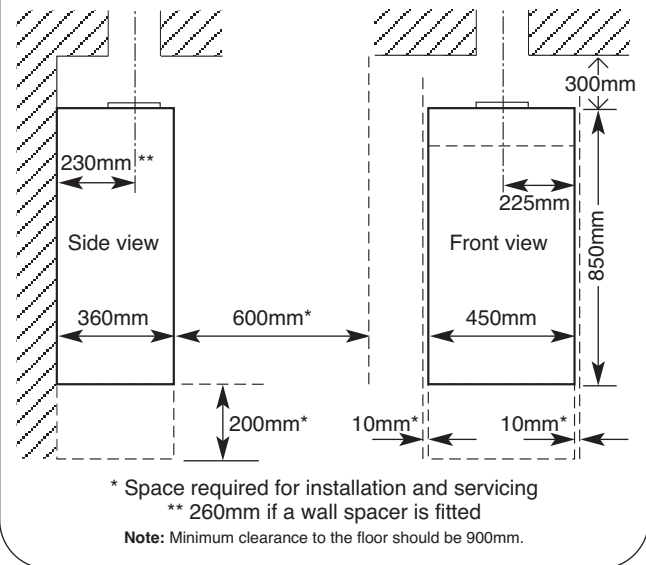
4.8 No combustible surface must be within 75mm of the casing. See BS476:4.

4.9 An airing space must be separated from the boiler space by a perforated non-combustible partition. Expanded metal or rigid wire mesh are acceptable provided that the major dimension is less than 13mm. See BS 6798:1987.

4.10 The distance between the inner face of a cupboard door and the cabinet front should not be less than 75mm.

4.11 The pipe connection positions on the manifold are shown in Fig 3 allowing the system to be pre-piped and flushed before the appliance is fitted. Always consider the possible need to disconnect the pipes from the appliance after installation.

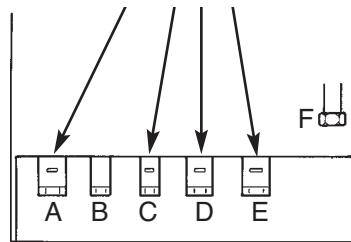
Fig. 2. Appliance casing dimensions and required clearances.



4.12 LPG Installation: The appliance shall not be installed in a room or internal space below ground level when it is intended for use with LPG. This does not preclude the installation into rooms which are basements with respect to one side of the building but open to ground level on the opposite side.

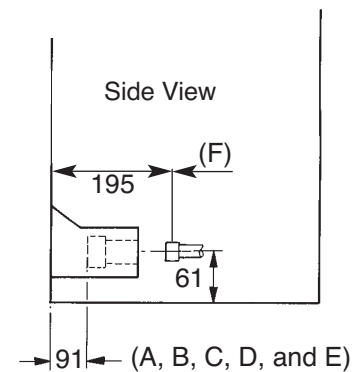
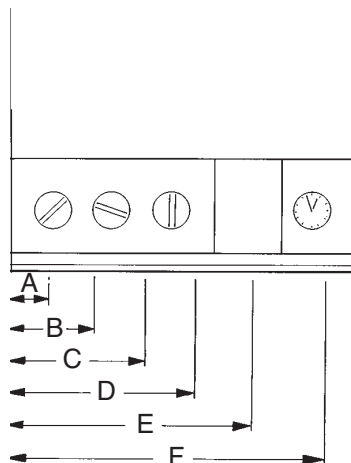
Fig. 3. Appliance pipework connections

Screw driver required to operate Valves.  
 Valves shown closed.



View on underside of appliance showing connections

A	CH Flow	=	62.5
B	DHW Out	=	127.5
C	Mains Cold Water In	=	192.5
D	Gas Inlet	=	257.5
E	CH Return	=	322.5
F	Safety Relief	=	382.5



## 5. Siting The Flue Terminal

- 5.1 The flue diameter is 125mm. Refer to BS 4543.
- 5.2 The flue must be installed as specified in BS 5440:Part 1.
- 5.3 A means of disconnection of the flue should be provided and positioned immediately above the appliance draught diverter.
- 5.4 Horizontal flue runs should be avoided and the flue should terminate in accordance with the requirements of BS 5440:1. The terminal must be of a type approved by British Gas.
- 5.5 If the flue is to be taken through the wall behind the appliance then adequate space must be available to allow the fitting of a suitable flue bend.
- 5.6 **A right-angle bend is not acceptable.**
- 5.7 A minimum of 600mm of vertical flue pipe is required before the introduction of a bend. If the flue is taken through the ceiling and into the roof space or room above then a sleeve of non-combustible material allowing an air space of at least 25mm between the flue and the sleeve must be provided. The flue pipe must be held in the centre of the sleeve.

## 6. Air Supply

- 6.1 The room in which an appliance is installed must have a permanent air vent to outside air or to a room which itself has direct access to outside air. The minimum effective area of the air vent(s) must be 104cm<sup>2</sup>.
- 6.2 Installations in cupboards or compartments require permanent vents for cooling purposes, one at high level and one at low level, either direct to outside air or to a room. Both vents must pass to the same room or be on the same wall to outside air.
- 6.3 Refer to BS 6798 and BS 5440:2 for additional information.
- 6.4 There must be sufficient clearance around the appliance to allow proper circulation of ventilation air. The clearances required for Installation and Servicing will normally be adequate for ventilation. See Section 4.6.
- 6.5 The minimum free areas required are given below.

POSITION OF AIR VENTS	AIR FROM THE ROOM	AIR DIRECT FROM OUTSIDE
HIGH LEVEL	270 cm <sup>2</sup>	135 cm <sup>2</sup>
LOW LEVEL	540 cm <sup>2</sup>	270 cm <sup>2</sup>

- 6.6 Refer to BS 6798 and BS 5440:2 for additional information.
- 6.7 A spillage test, as detailed in BS 5440:1, must be carried out and any remedial action taken to ensure that the installation meets the standard. The effect of any type of extract fan in the premises must be considered and an additional air inlet may be needed from outside to counter the effect of the fan.
- 6.8 A compartment containing an open-flued appliance shall be labelled as follows:

**"IMPORTANT:** Do not block the vents.  
Do not use the  
compartment for storage."

**Note:** In an airing cupboard situation the section containing the appliance is the compartment.

## 7. Sealed Primary Systems

See Figs. 4, 5 and 5a

7.1 The system must comply with the requirements of BS 6798 and BS 5449.

7.2 The appliance must not be operated without the system being full of water, properly vented and pressurised.

7.3 The pressure relief valve operates at 3 bar (45lb/in<sup>2</sup>). The discharge must be directed away from electrical components or where it might be a hazard to the user.

7.4 The pressure gauge indicates the system pressure which must be maintained.

7.5 The 10 litre expansion vessel is charged to 0.5 bar and is suitable for a static head of 5 metres (17.5ft). The pressure can be increased if the static head is greater than 5 metres (17.5ft).

7.6 With an initial system pressure of 0.5 bar, a system capacity of about 72 litres can be accommodated. Refer to BS 7074 for more information. The charge pressure can be increased but with a decrease in system volume.

7.7 The appliance includes a system filling link.

7.8 Water loss must be replaced.

7.9 Repeated venting loses water from the system. It is essential that this water is replaced and the system pressure maintained. Refer to Section 13 Commissioning.

7.10 Connections to the mains water supply must not be made without the authority of the local Water Company.

7.11 The pump is set at maximum and must not be adjusted.

7.12 Connections in the system must resist a pressure of upto 3bar.

7.13 Radiator valves must conform to BS2767:10.

7.14 Other valves used should conform to the requirements of BS1010.

7.15 No special system inhibitor is needed.

## 8. Gas Supply

8.1 The appliance requires 2.9 m<sup>3</sup>/h of natural gas (G20) or 1.13 m<sup>3</sup>/h of propane (G31). Check that the supply system can accommodate this together with any other appliances connected to it. Refer to Table 7.

8.2 A natural gas appliance must be connected to a governed meter.

8.3 There must be a pressure of 20mbar (G20) or 37mbar (G31) at the inlet to the appliance. This is equivalent to a pressure of 18.5 - 19.0mbar (G20) or 35 - 35.5mbar (G31) at the inlet pressure tapping on the gas valve.

Fig. 4. Sealed primary water system.

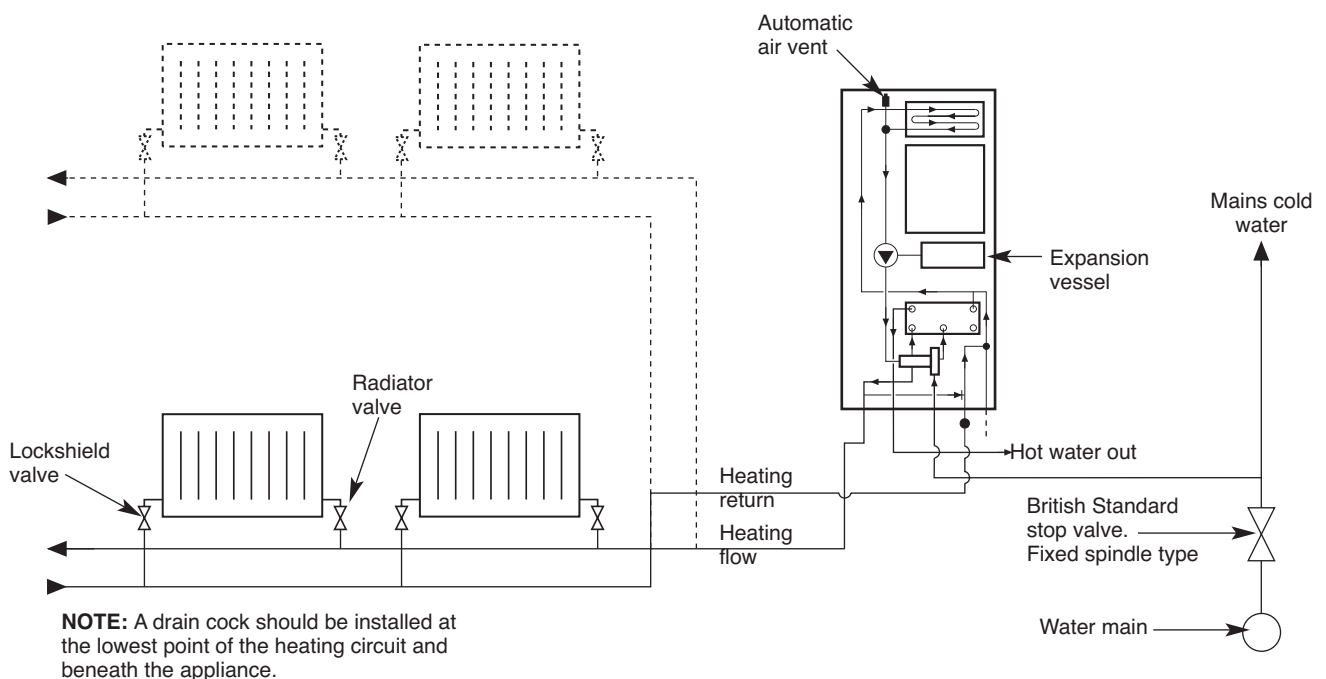


Fig. 5. Filling Loop.

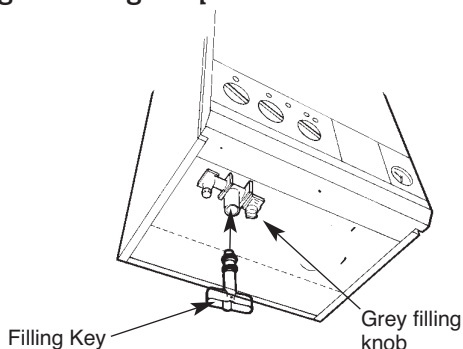
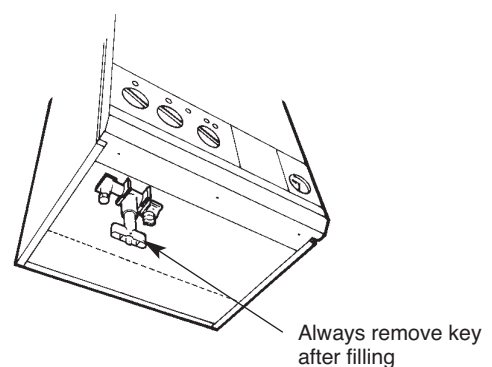


Fig. 5a. Filling Key inserted for filling.





## 9. Open Vent Primary Systems

9.1 The size of the flow and return pipework is given in Section 3 – Table 4. The components required to connect the appliance to an open vent system are available as an optional extra kit.

9.2 The feed and expansion cistern should be arranged so that there is a minimum static head of 0.3 metres (12 inches) above the top of the appliance or above the highest point in the heating circuit, whichever is the higher. See Fig. 6

9.3 The feed and vent pipe should be 22mm diameter and rise continuously from the appliance to the feed and expansion cistern.

9.4 A pressure relief valve is not required on an open vented system.

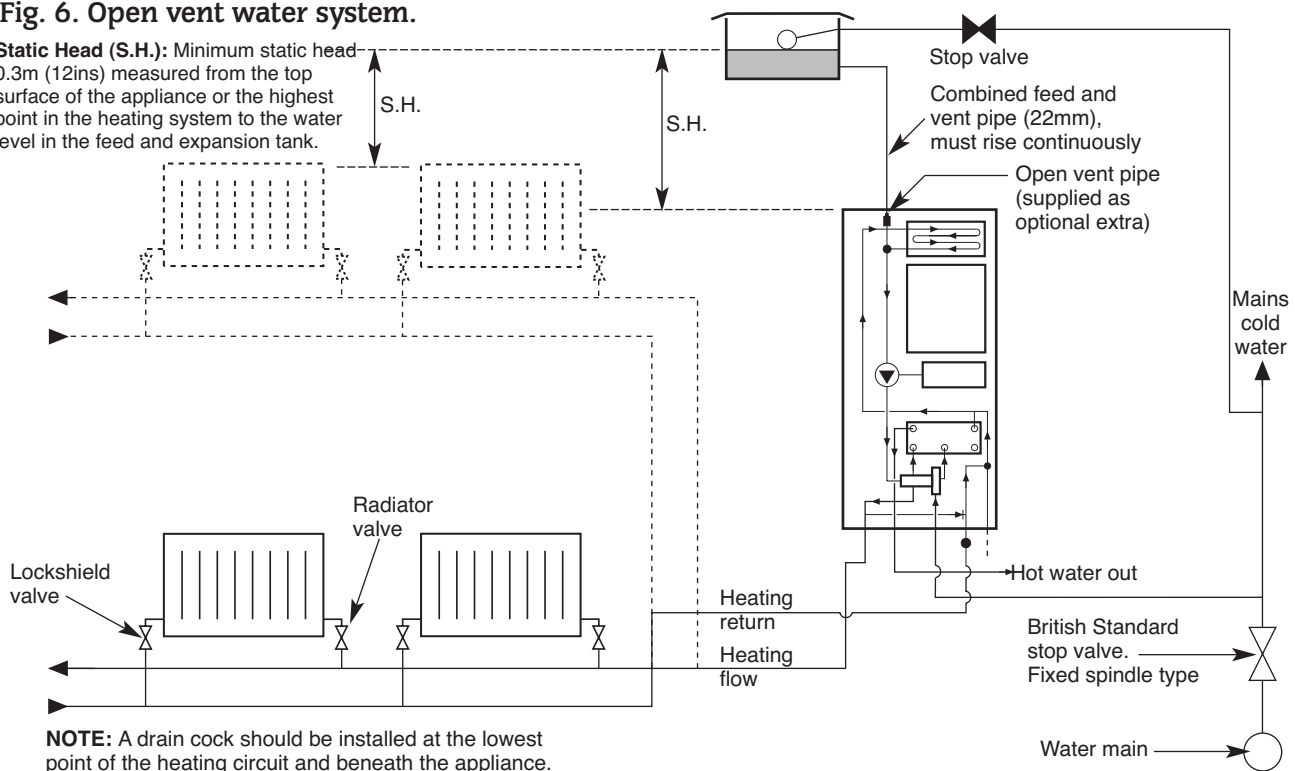
9.5 Air within the appliance will be expelled via the feed and vent connection or dissipated into the rest of the system which must be fitted with manual air vents at any high point.

9.6 The pump is set to maximum and must not be reset.

9.7 If it is required to use the appliance for domestic hot water before the central heating circuit is connected, a 22mm copper by-pass must be connected between the central heating flow and return. Refer to Section 12.

**Fig. 6. Open vent water system.**

**Static Head (S.H.):** Minimum static head 0.3m (12ins) measured from the top surface of the appliance or the highest point in the heating system to the water level in the feed and expansion tank.



## 10. Domestic Hot Water

10.1 The following are general requirements and, if necessary, reference should be made to the local Water Company before fitting the appliance.

10.2 **MAINS COLD WATER INLET.** Devices capable of preventing the flow of expansion water must not be fitted unless separate arrangements have been made. An expansion vessel connection point is provided within the appliance. An Rc1/2 connection is provided. A mini expansion vessel kit is available from Worcester Heat Systems Ltd. A thread sealant compatible with potable water must be used.

10.3 The final 600mm of the mains cold water connection to the appliance should be made in copper tube only.

10.4 The appliance is suitable for a mains pressure of up to 10 bar (150 lb/in<sup>2</sup>).

10.5 The appliance is fitted with a mains supply isolating valve.

10.6 The maximum domestic hot water flow rate is 9.0 litres/min (± 15%) (2.0 gallons/min).

10.7 In winter (when the mains inlet water temperature is lower) a reduced flow rate at the taps may be required to achieve the hot water delivery temperature available in warmer weather.

10.8 It is suggested that long pipe runs to the taps or shower should be insulated to prevent the rapid cooling of domestic hot water after a tap or shower has been turned off.

10.9 Hot and cold taps and mixing valves used with this

appliance must be suitable for operating at mains pressure and temperatures of 65°C.

10.10 No anti-siphonage arrangements are necessary except for some loose head showers. See also Section 10.12.

10.11 Thermostatically controlled or pressure equalising shower valves will guard against the flow of water at too high a temperature.

10.12 The head of a loose head shower must not fall closer than 25mm (1in) above the top edge of the bath to prevent its immersion in bath water. Alternatively the shower must be fitted with an anti-siphonage device at the point of the flexible hose connections.

10.13 The supply of hot and cold mains water direct to a bidet is permitted, subject to local Water Company requirements, provided that the bidet is of the over-rim flushing type. The outlet(s) should be shrouded and unable to have any temporary hand held spray attached. No anti-siphonage arrangements are necessary.

10.14 As the maximum temperature of the Water to Water heat exchanger is limited by the control circuit, there is normally no need for water treatment to prevent scale accumulation. In exceptional circumstances a device to prevent scale formation can be fitted.

Installation of a scale inhibitor assembly should be in accordance with the requirements of the local Water Company. An isolating valve should be fitted to allow servicing. The water hardness can be determined using a standard test paper or by reference to the local Water Company.

## 11. Electrical

11.1. Mains supply : 230V ~ 50Hz, 140 watts. External fuse 3A, Internal fuses F1 - 2A, F2 - 1.25A (20mm). Spare internal fuses are supplied with the appliance. Refer to Fig 13.

11.2. The appliance must be earthed. It must be possible to completely isolate the appliance.

11.3. The mains cable must be 0.75mm<sup>2</sup> (24x0.20 mm) to BS6500-Table 15 or 16.

11.4 The mains cable must be connected to the terminal ST12 marked L (red or brown lead), N (black or blue lead ) and the Earth stud (green or green/yellow lead) and secured with the cable clamp. Check that sufficient loose lead has been left to allow access to the control box. The Earth lead must be still be slack when the other leads are taut. Refer to Fig 7.

11.5. The connection to the mains must be either: A 3A fused three-pin plug and unswitched socket outlet, both complying with BS1363 or a double pole isolator with a contact separation of 3mm in all poles and supplying the appliance and controls only.

11.6. Access to the mains connection on the driver board is gained by removing the bottom cover from the fascia. Refer to Fig 11.

11.7. A room thermostat or an externally mounted programmer must be suitable for mains voltage operation and the leads securely fixed in the clamps provided. The controls must be earthed at the connection on the control board. Refer to Fig 10 and 12.

11.8. A programmer, to fit into the fascia, is available to control the CH. Full instructions are sent with the programmer. Refer to Fig 14.

11.9. A clock, to fit into the fascia, is available to control the operation of the central heating.

11.10. On very rare occasions an external frost thermostat might be considered where parts of the system are remote from the appliance. Refer to Worcester Heat Systems Technical Department for more information - Tel: 0990 266241.

11.11. A radio frequency room thermostat is available for use with the appliance.

11.12. **Safety Check:** If there is an electrical fault after installation check for fuse failure, short circuits, incorrect polarity of connections, earth continuity or resistance to earth.

Fig. 7. Mains electricity connections.

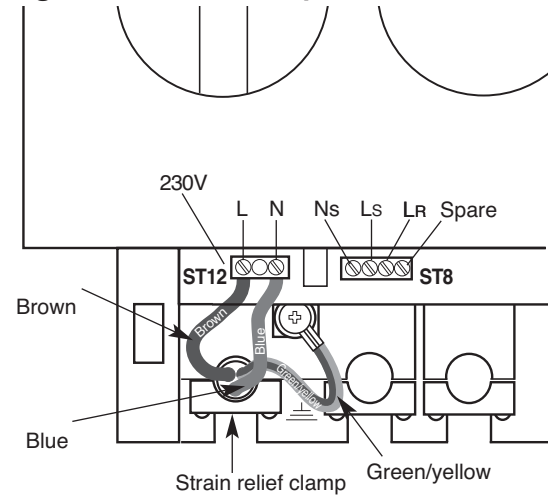


Fig. 8. Wiring diagram.

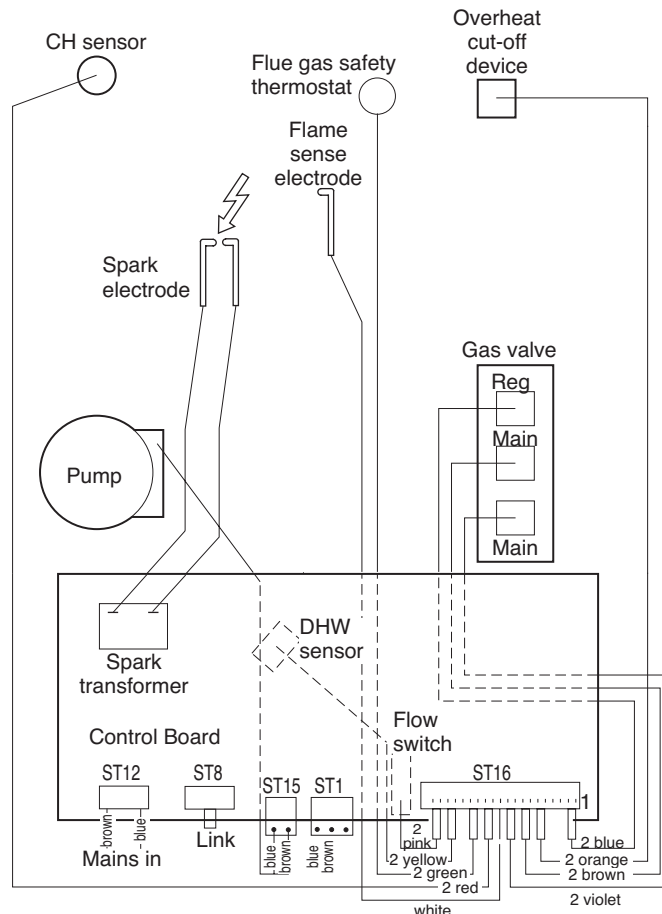
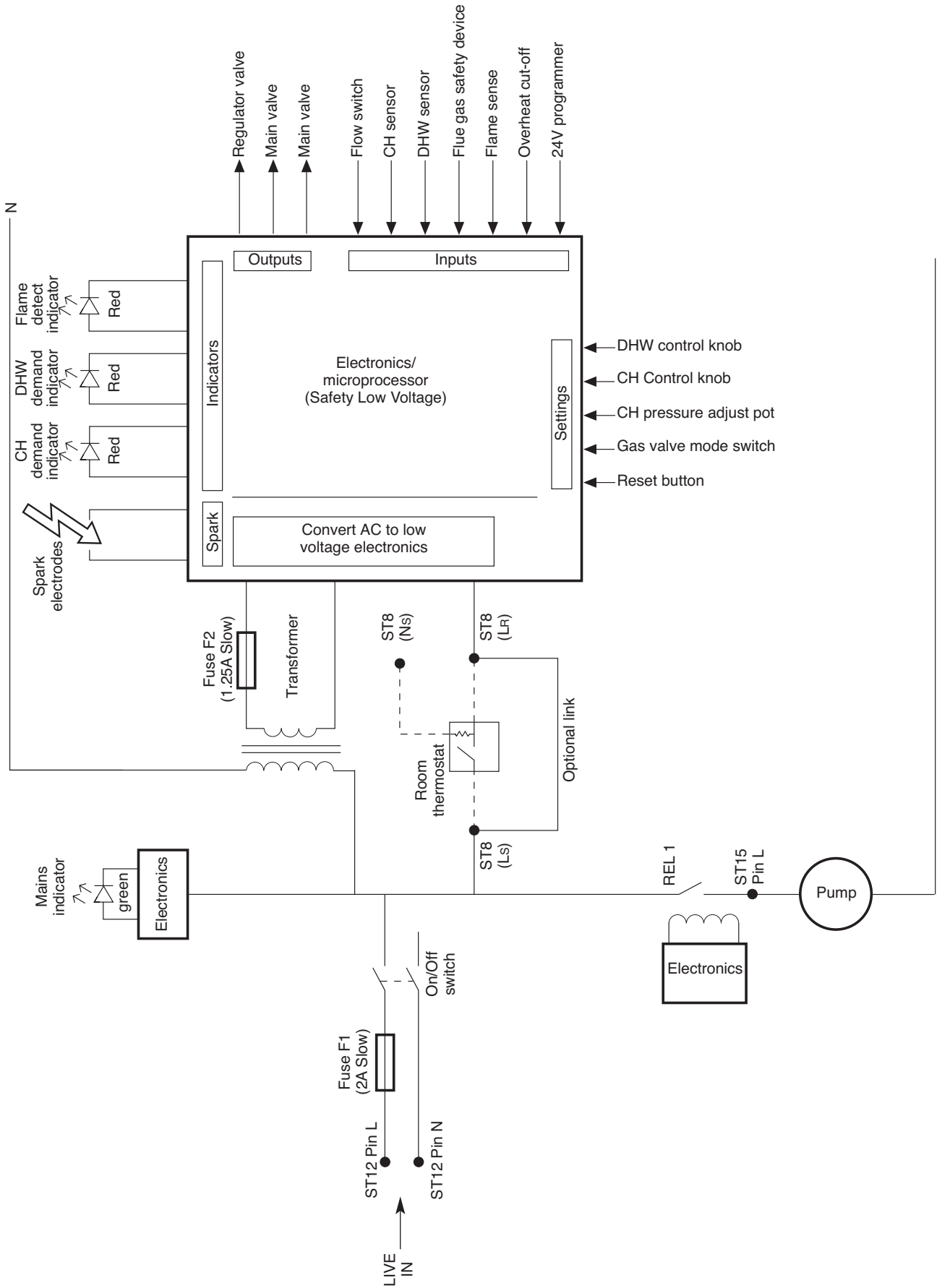
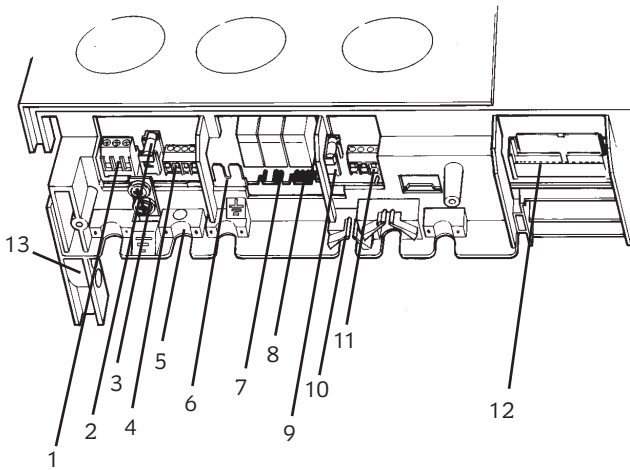


Fig. 9. Functional flow diagram.

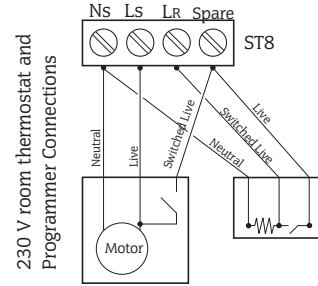
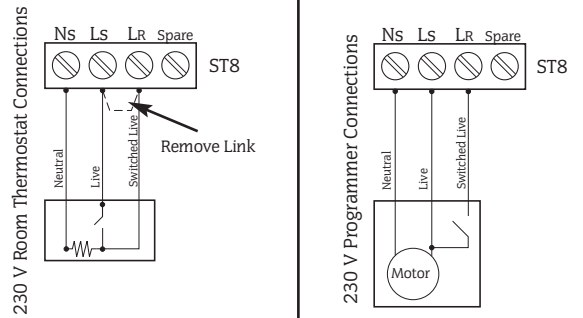


**Fig 10 - Electrical Connections**

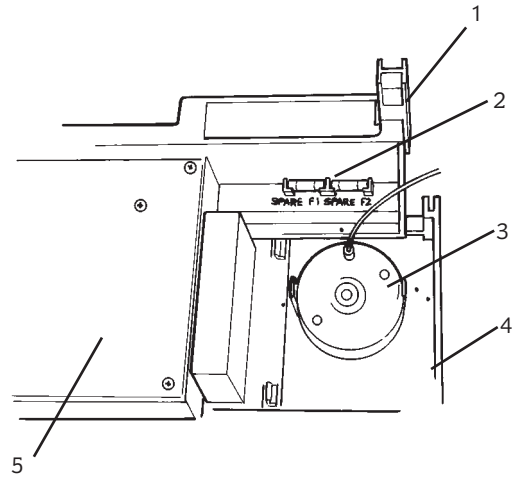


- |  |                               |
|--|-------------------------------|
| 1. ST12-Mains  | 9. Fuse-F2                    |
| 2. Fuse-F1   | 10. Cable Entry Clamp         |
| 3. Earth Screw   | 11. ST13-24volt Controls      |
| 4. ST8-Room Thermostat and External Control -Mains Voltage | 12. Main Harness and Clamp    |
| 5. Cable Entry Screw Clamp                                 | 13. Control Panel Pivot Point |
| 6. Earth Tag   |                               |
| 7. ST15-Pump   |                               |
| 8. ST1-Fan   |                               |

**Fig 12 - Mains Voltage External Controls Connections**

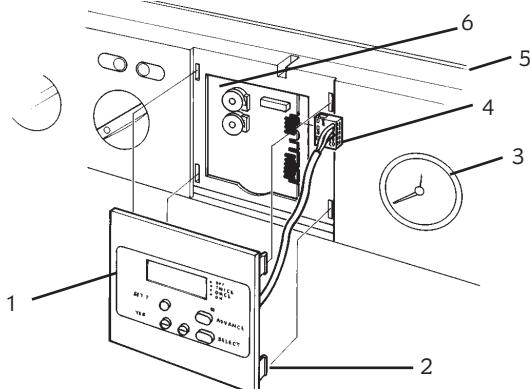


**Fig 13 - Replacement Fuses**



- |                              |                           |
|------------------------------|---------------------------|
| 1. Control Panel Pivot Point | 4. Facia Panel            |
| 2. Fuses-F1, F2              | 5. Control Board Assembly |
| 3. Pressure Gauge            |                           |

**Fig 14 - Programmer Connection**



- |                           |                         |
|---------------------------|-------------------------|
| 1. Programmer             | 4. Programmer Connector |
| 2. Programmer Fixing Clip | 5. Facia                |
| 3. Pressure Gauge         | 6. Control Board        |

## 12. Installation

Read this section fully before starting the Installation.

### 12.1 General.

The appliance is supplied suitable for fitting to a sealed system. If it is to be fitted to an open vent system refer to Section 8.

The flue must be installed in accordance with BS5440:1

### 12.2 Unpacking and Appliance Preparation.

Remove packaging from the appliance leaving it to stand upright on the polystyrene plinth.

Using the two M4 thread-forming screws supplied in the hardware pack assemble the wall-plate cross members to the pre-plumbed manifold. Refer to Fig 15.

### 12.3 Site Preparation

Check that the wall is sound, flat and will support the weight of the appliance. Refer to Table 4.

Check that the position chosen for the appliance is in accordance with the instructions given in Section 4 and 5.

Ensure that the plastic cover over the valves and 'O' rings is left in place. The cover will protect the valves and 'O' rings against the ingress of dirt and dust.

### 12.4 Fixing Holes and Flue Opening

Hold the wall-plate to the wall. Check that the plumbing manifold is level.

Mark the position of the fixing holes. Two at the top and two on the plumbing manifold.

Mark the position of the appliance centre-line from the 'V' formed by the wall-plate cross-member. Refer to Fig 15.

Mark a horizontal line across the top of the plumbing manifold.

### 12.5 Wall-mounting Plate and Manifold

Fit the plugs and fix the plate/manifold assembly to the wall.

Check that the assembly is properly aligned before tightening the screws.

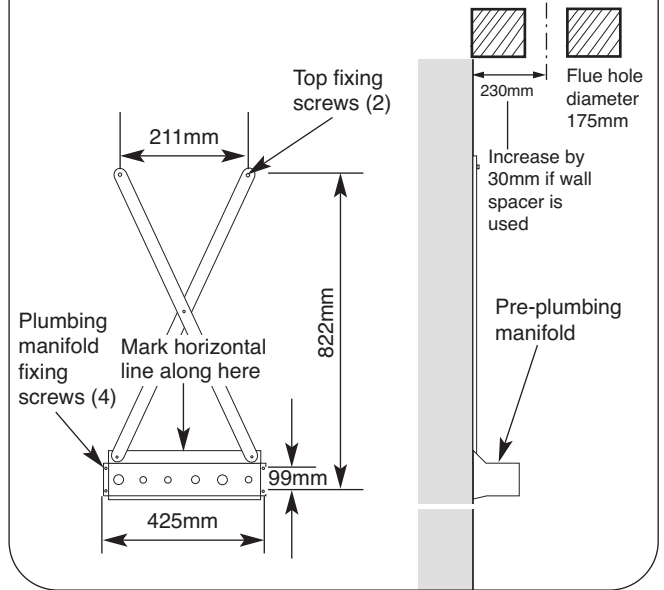
Prepare the opening in the ceiling for the flue pipe. Refer to Fig. 2,15.

If the pipes are to pass up the rear of the appliance then a wall spacer 30mm deep (optional extra) must be used with the corresponding adjustment in the position of the opening in the ceiling.

### 12.6 Gas and Water Pipes

Remove and discard the plastic cover protecting the valves and

Fig. 15. Fixing the wall mounting plate.



'O' rings. Check that the 'O' rings are fitted and that they are clean and lubricated.

Remove the gas cock, fix the appropriate fitting to connect to the inlet pipe and replace.

Connect the water connections to the manifold. Refer to Fig 3.

Pre-plumbing is not advised if no movement in the pipework is not available.

Pipework can only run horizontally outside the limits of the casing. It is important that the pipes are not fixed near the appliance using clips that put a strain on the connections.

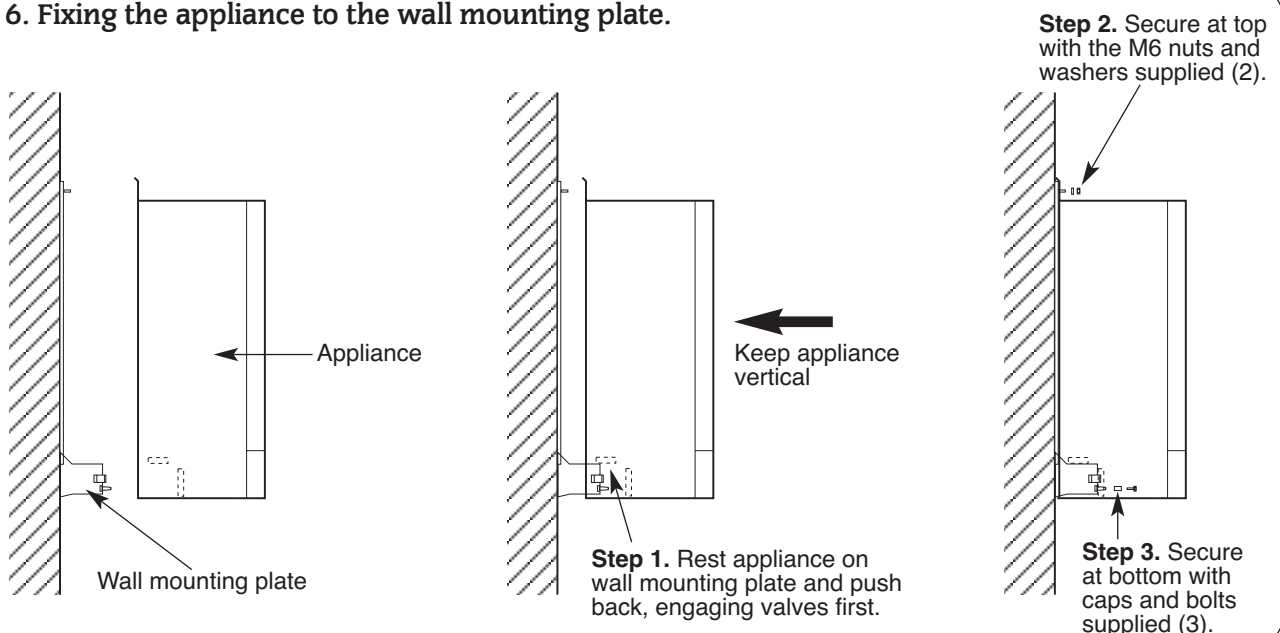
Before the appliance is fitted to the wall the primary system and the mains supply must be thoroughly flushed and treated in accordance with the recommendations of BS7593:1992.

### 12.7 Install the Boiler

Slide the appliance onto the pre-plumbing manifold ensuring that the three pegs are located correctly.

Secure with two M6 nuts and washers at the top and screw the appliance to the manifold at the bottom using the three retaining caps and M6 bolts. Refer to Fig 16.

Fig. 16. Fixing the appliance to the wall mounting plate.



Access to these pegs and caps can be made easier by removing the bottom panel. Refer to Section 15.3, d.

Unscrew and discard the automatic air vent cap. Refer to Fig. 17.

Connect the flue pipe to the appliance and seal the gap between the pipe and the spigot. The flue must be supported so that its weight is not put upon the appliance. Connect and make good the flue system and terminal as specified in BS 5440:1

### 12.8 FINAL INSTALLATION

Check that all the water and gas connections have been tightened.

If a fascia mounted programmer is to be fitted follow instructions with the programmer.

Hinge down the fascia as described in Section 15.3, c.

Connect the mains electrical supply to the appliance at terminal ST 12 See Fig. 7. Connect any room and/or frost thermostats. The electrical leads must pass through the appropriate space in the control panel and be fixed with the cable clamps provided. See Fig. 10. Refit the fascia panel.

Test the gas supply pipework up to the appliance for soundness as indicated in BS 6891.

Refer to Section 13.2 for a full description of the filling, venting and the pressurising of the system.

If the appliance is not to be commissioned immediately, replace the cabinet front panel. Check that the gas supply, the electrical supply and the water connections are all turned off.

If the premises are to be left unoccupied during frosty conditions, then drain the appliance and system. For short inoperative periods, leave the appliance under the control of the built in frost thermostat or the remote frost thermostat (if fitted) or leave operating continuously with the room thermostat set at 6°C.

## 13. Commissioning

### 13.1 SUMMARY

The appliance is dispatched with the controls set to provide a maximum output for domestic hot water and central heating of 24 kW (81,900 Btu/h).

The appliance automatically modulates to satisfy lower heat loads.

#### Domestic Hot Water Circuit

Confirm that the mains water supply has been flushed out at installation. If not it will be necessary to disconnect the cold water inlet pipe from the appliance and thoroughly flush.

#### Central Heating System

Confirm that the system has been fully flushed out at installation using a flushing agent. Flush the system before starting to commission the appliance and, at the end of the commissioning procedure, add a suitable flushing agent and drain whilst hot. Immediately refill and re-pressurise.

**Gas Service. The complete system, including the meter, must be inspected and tested for soundness and purged as indicated in BS 6891. In the event of a leak, or suspected leak, at the 'O' ring joint on the main appliance manifold, connect a manometer to the test point on the inlet of the multifunctional gas valve. A soundness test carried out after turning off the appliance gas cock will test the section between the gas cock and the gas valve, thus enabling the leak to be traced to either a visible joint or to the 'O' ring.**

### 13.2 APPLIANCE AND CENTRAL HEATING SYSTEM – PREPARATION

Remove the cabinet front panel.

Check that the electrical supply and the gas service to the appliance are off. Refer to Fig. 3.

Check that all the water connections throughout the system are tight. Open the system valves at the appliance. Open all the radiator valves, fill the system and vent each radiator in turn.

Remove the bottom panel to gain access to the filling loop assembly. (The grey knob for the filling loop is packed in the

hardware pack and should be fitted as shown in Fig. 5,5a.

Insert the bayonet end of the filling key into the corresponding cutouts in the filling loop housing and twist to lock the key in place. Turn the grey knob anti-clockwise to allow water ingress and fill until the pressure gauge reads 2.5 bar.

Turn the grey knob clockwise to stop filling and remove the filling key by lining up the bayonet end of the key with the cutouts in the filling loop housing and withdrawing the key.

**N.B. The key must always be removed from the filling loop housing after the system has been filled to prevent accidental filling and to comply with Byelaw 14 of the Water Byelaws Scheme.**

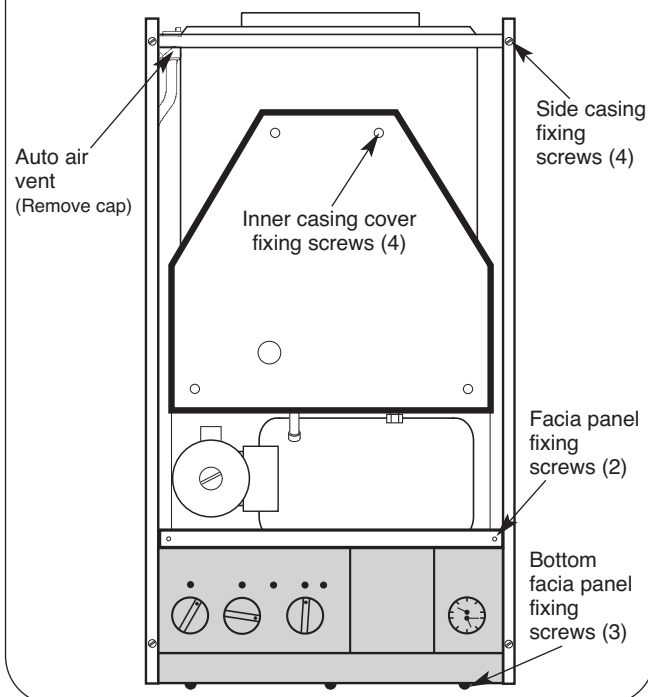
Store the key in a safe place for future use and refit the bottom panel.

The automatic air vent will vent the appliance. Check that the air vent cap has been loosened. See Fig. 17.

Check that the pressure relief valve operates by turning the knob anti-clockwise until it releases. Water should be expelled from the discharge pipe. See Fig. 18.

Lower the fascia panel to gain access. Refer to Fig. 17.

Fig. 16. Appliance casing and control equipment fixings.



#### Set the Expansion Vessel Pressure

The charge pressure of the expansion vessel as dispatched is 0.5 bar, which is equivalent to a static head of 5 metres (17 ft). The charge pressure must not be less than the static head at the point of connection. See Fig. 6. A Schraeder type tyre valve is fitted to the expansion vessel to allow the charge pressure to be increased if necessary.

#### Set the system pressure

Release water from the system using the relief valve test knob (see Fig. 18), until the system design pressure is obtained, up to a maximum of 1.5 bar.

Initial system design pressure (bar) = Expansion vessel charge pressure + 0.3 bar.

**NOTE:** 1 bar is equivalent to 10.2 metres (33.5ft) of water.

Set the movable pointer on the pressure gauge to coincide with the indicating pointer giving a permanent record of the set system pressure.

If the pressure indicated on the pressure gauge is greater than 2.6 bar when operating at the maximum central heating temperature, an extra expansion vessel must be fitted to the system as close as possible to the appliance central heating return connection.

The appliance (as dispatched) can accommodate a system volume of about 83 litres. Refer to BS 7074 Part 1. If the system volume is in excess of that accommodated by the expansion vessel fitted to the appliance then an extra expansion vessel must be fitted as close as possible to the central heating return connection of the appliance.

Any extra vessel fitted must be pressurised to the same figure as the integral vessel. If the expansion vessel fails then the specified replacement must be fitted.

### 13.3 PROGRAMMER

Any programmer fitted on the appliance should be set up at this stage following the instructions sent with the programmer.

The programmer will retain the setting for up to three weeks following an interruption in the electricity supply.

### 13.4 APPLIANCE OPERATION

Turn off the gas and electricity supplies to the appliance.

Loosen the burner pressure test point screw on the gas valve and connect a pressure gauge. See Fig. 20.

Undo the two screws and hinge down the fascia to gain access to the mode switch. Refer to Fig. 17.

### Domestic Hot Water

Set the gas valve mode switch, at the rear of the fascia, to the maximum position.

Turn on the gas and electricity supplies.

Set the CH temperature control knob fully anti-clockwise to and the DHW temperature to MAX.

Open a hot water tap.

A continuous ignition spark will occur until the burner is alight and sensed by the control circuit. The burner pressure should be 13.2mbar for natural gas and 35.5mbar for propane. If the burner pressure cannot be achieved then check that the inlet pressure at the appliance is 20mbar for natural gas and 37mbar for propane. This is equivalent to a 18.5-19.0 mbar (G20) or 36 mbar (G31) at the gas valve.

Set the gas valve mode switch to the minimum position.

The burner pressure will drop to the minimum setting which should be 2mbar for natural gas or 5.5mbar for propane.

Test for gas soundness at the joint between the burner and the gas valve with leak detection fluid.

**NOTE:** The burner pressure is factory set and if (after checking that the supply pressure is sufficient) the correct pressure is not obtained then Worcester Heat Systems Service Department should be contacted.

Fig. 18. Pressure relief valve.

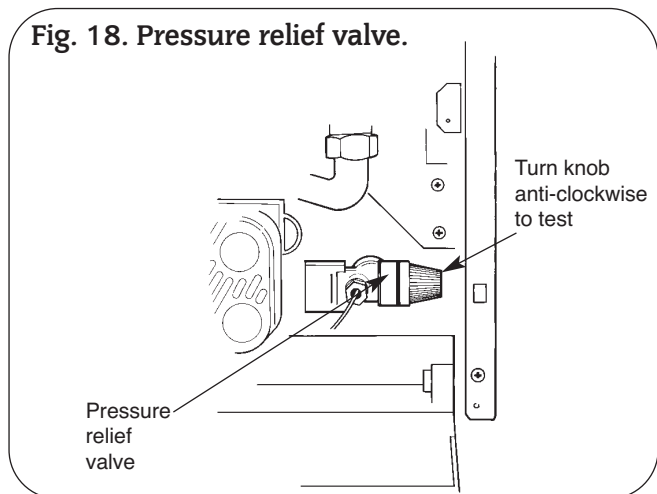


Fig. 19. Central heating by-pass adjustment.

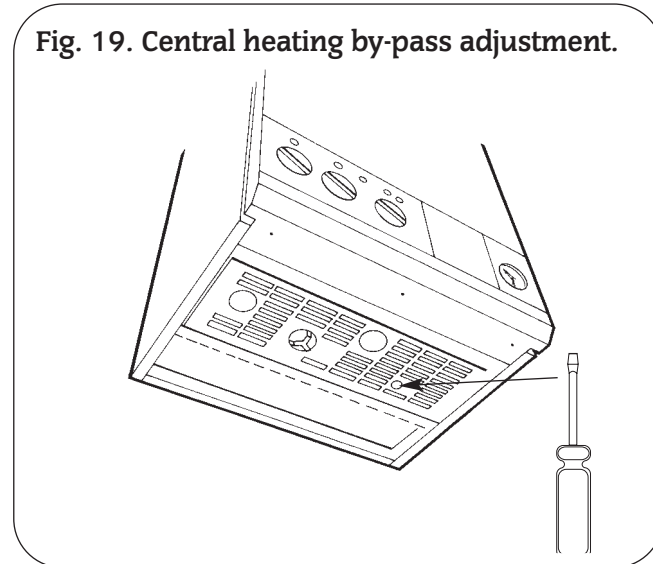
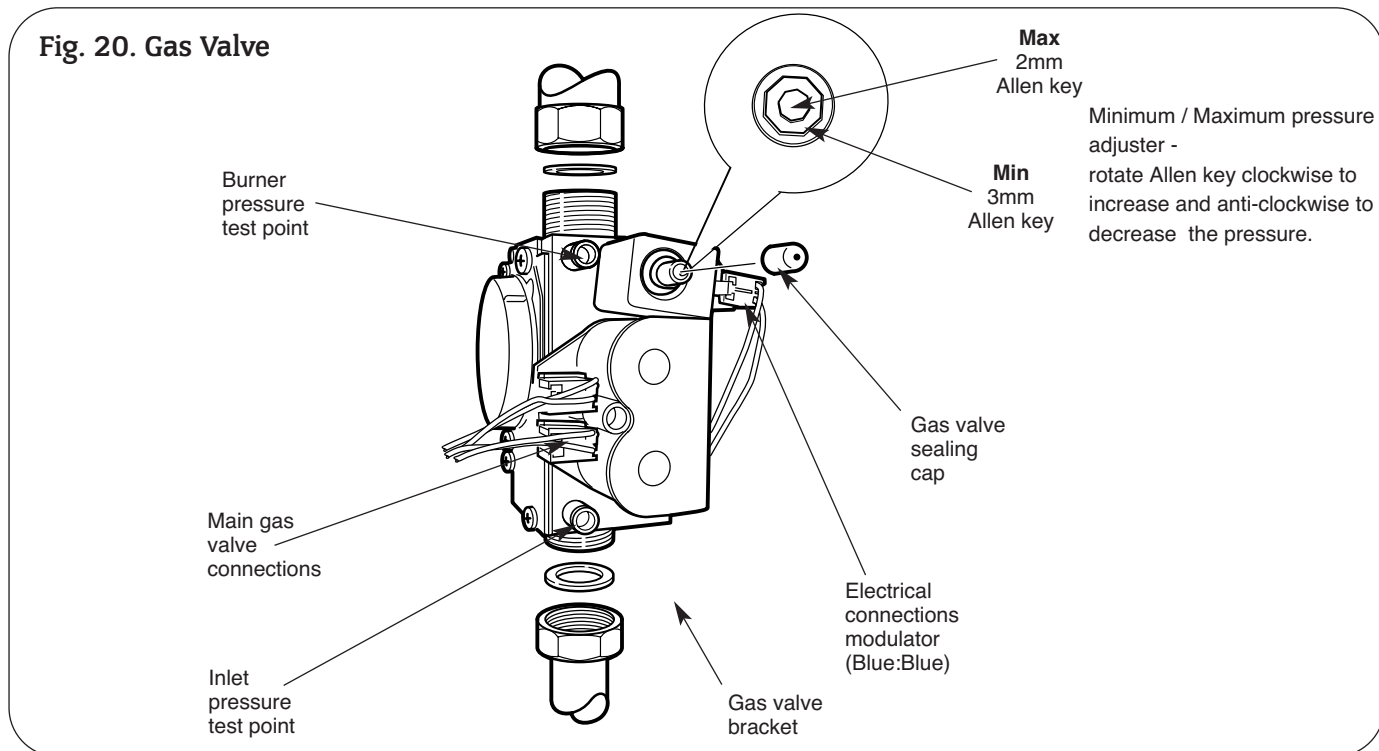


Fig. 20. Gas Valve



If the appliance does not light, check that it is not in the 'lockout' state by pressing the lockout reset button. See Fig. 21.

Set the gas valve mode switch back to the normal position and refit the fascia.

Turn off the electricity supply, and then back on again to reset the controls.

Gradually close the hot tap and check that the burner pressure drops. Fully open the tap and check that the burner pressure rises. Fully close the tap and check that the burner goes off. The fan may continue running until the appliance has cooled to a preset temperature.

Set the Operating Switch to OFF.

### **Central Heating**

Check that all the radiator valves are open. Set the room thermostat and the Central Heating Temperature Control to maximum. Set the DHW temperature control to MIN.

On sealed systems check that the system is pressurised and set to the required pressure as indicated on the gauge.

Set the Programmer, if fitted, to HEATING & WATER.

Set the operating switch to ON.

The burner will light.

The appliance will modulate its output from 11.9 to 24.0 kW over a period of about two minutes.

Check the system to ensure that all the radiators are heating up evenly. If not then bleed each radiator through its vent screw.

Shut down all but one of the radiators and observe the burner pressure fall. Open all of the radiator valves and check that the burner pressure rises.

Balance the system so that the required temperature difference across the central heating flow and return pipes is obtained. See Table 3.

Adjust the central heating by-pass valve until the same temperature difference is obtained. See Fig. 19. This should be carried out with only a single radiator operating. If thermostatic radiator valves are fitted then one radiator should be left uncontrolled. The bypass valve should never be fully closed.

Set the room thermostat to minimum and check that the burner goes out. Reset the room thermostat to maximum and the burner will re-light and follow the normal operating procedure.

Check for proper ignition of the burner after a break in the gas supply. Turn off the gas service cock and wait for 60 seconds. The burner will go out but sparking from the electrode will continue for 10 seconds when the appliance will enter a 'lockout' state. Carefully open the gas service cock, press the lockout reset button and observe the burner re-light and follow the normal sequence of operation. Refer to Fig.21.

Set the Operating Switch to OFF.

Turn off the gas service cock and the electrical supply to the appliance.

Drain the system while the appliance is still hot.

Refill, vent and, with a sealed system, re-pressurise as described in Section 13.2.

### **Domestic Hot Water and Central Heating**

Turn on the electricity supply to the appliance and open the gas supply cock at the appliance.

Set the Operating Switch to ON. If a programmer is fitted, set the domestic hot water to Continuous or 24Hrs and the central heating to ON. The burner will light and heat will pass into the system. Set the DHW temperature to MAX and turn on a hot water tap and check that fully heated hot water is discharged from the tap.

Close the tap and the burner will go off. The appliance will then return to the central heating mode and automatically balance with the system requirements.

Set the Operating Switch to OFF and the burner will go out.

### **12.5 COMPLETION OF COMMISSIONING**

Disconnect the pressure gauge from the gas valve and tighten the test point screw.

Restart the appliance and check for gas soundness around the

test point screw.

Refit the cabinet front panel.

If the appliance is being passed over to the user immediately, refer to Section 14 - Instructions to the User.

If the appliance is to be left inoperative, check that the Operating Switch is set to OFF. Turn off the gas service cock.

For short inoperative periods, leave the appliance under the control of the built in frost thermostat or the remote frost thermostat (if fitted) or leave operating continuously with the room thermostat set at 6°C

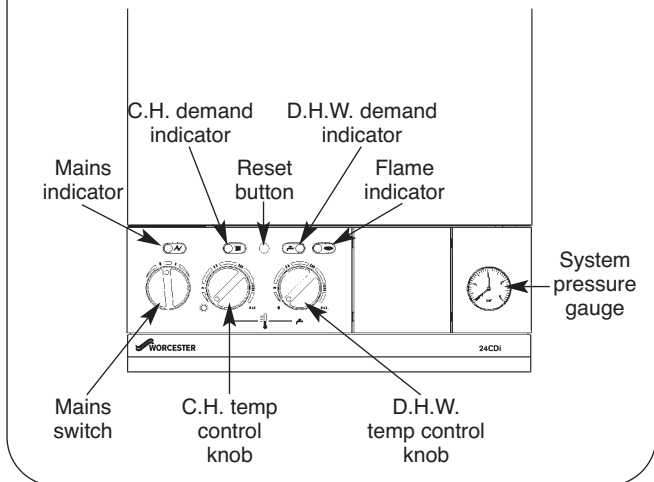
Do not switch off the electricity supply.

If there is any possibility of the appliance and the system being left totally unused in freezing conditions then switch off the gas and electricity and drain the appliance and the system.



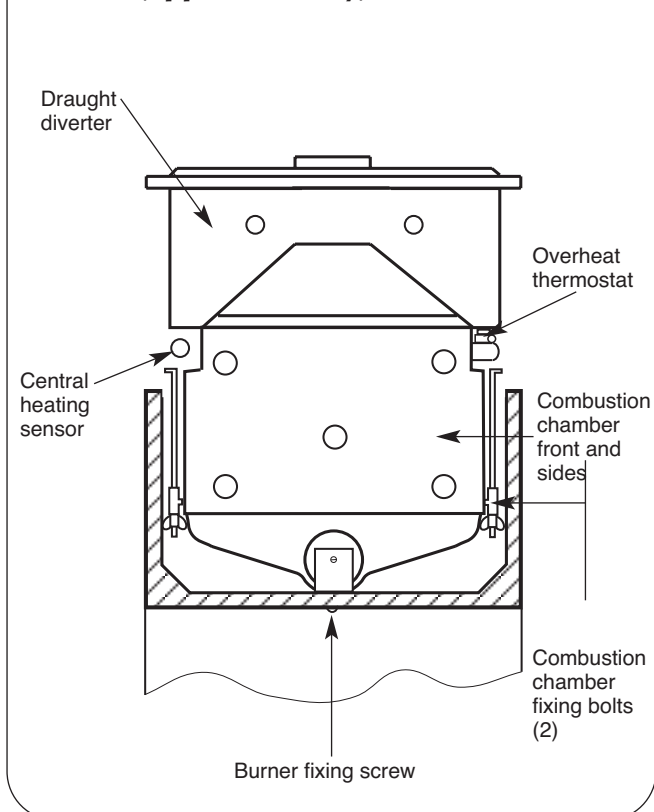
## 14. Instructions To The User

Fig. 21. User controls.



- 14.1 Tell the user how to operate the appliance and hand over the Users Instructions leaflet.
- 14.2 Tell the user what to do if the heating system is not to be used in frosty or freezing weather.
- 14.3 Tell the user the sealed system set pressure.
- 14.4 Tell the user of the importance of regular servicing. Worcester Heat Systems Ltd. offer a comprehensive maintenance contract.
- 14.5 Set the system controls to the user's requirements.
- 14.6 If an external programmer has been fitted which has a programmable domestic hot water facility then it is suggested that this be set to Continuous or the equivalent
- 14.7 Tell the user about the safety devices and hazard notices.

Fig. 22. Appliance components and fixings (upper assembly).



## 15. Inspection And Servicing

### 15.1 SERVICING

To ensure continued efficient operation of the appliance it must be checked and serviced as necessary at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but once per year should generally be adequate. The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers.

Any service work must be carried out by competent engineers such as British Gas or Corgi registered personnel.

### 15.2 PRE-SERVICE INSPECTION

Check that the flue terminal and the terminal guard, (if fitted), are clear. If the appliance is in a compartment, check that the ventilation openings in the compartment door or walls are clear. See Section 6 - Air Supply.

Check the system and remake any joints or fittings which show signs of leakage. Refill, vent and re-pressurise as described in Section 13.2.

Operate the appliance and the system taking note of any faults.

### Measurement of the Flue Gases

For consistency of results of the flue gas measurements it is necessary to have a constant output and stationary equilibrium.

Switch on the appliance.

Switch to DHW and CH mode.

Hinge down the facia.

Turn the Mode Switch to the "Max." position.

Wait until the appliance reaches stationary equilibrium (approx. 10 minutes).

Insert the probe into the flue duct.

Expected measurements should be between:

CO: 0.0015 and 0.0025%.

CO<sub>2</sub>: 4.5 - 5.5%.

After taking the measurement:

Turn the Mode Switch back to the "normal" position.

Put the facia back in to its normal position.

### SAFETY

Disconnect the electrical supply at the mains and turn off the gas supply at the gas service cock on the appliance before servicing.

After completing the service always test for gas soundness as indicated in BS 6891.

### 15.3 COMPONENT ACCESS

To carry out a full and comprehensive service of the appliance remove the following parts to gain access to the components which need to be checked or serviced.

(a) **Cabinet Front Panel.** Remove by lifting off the supports.

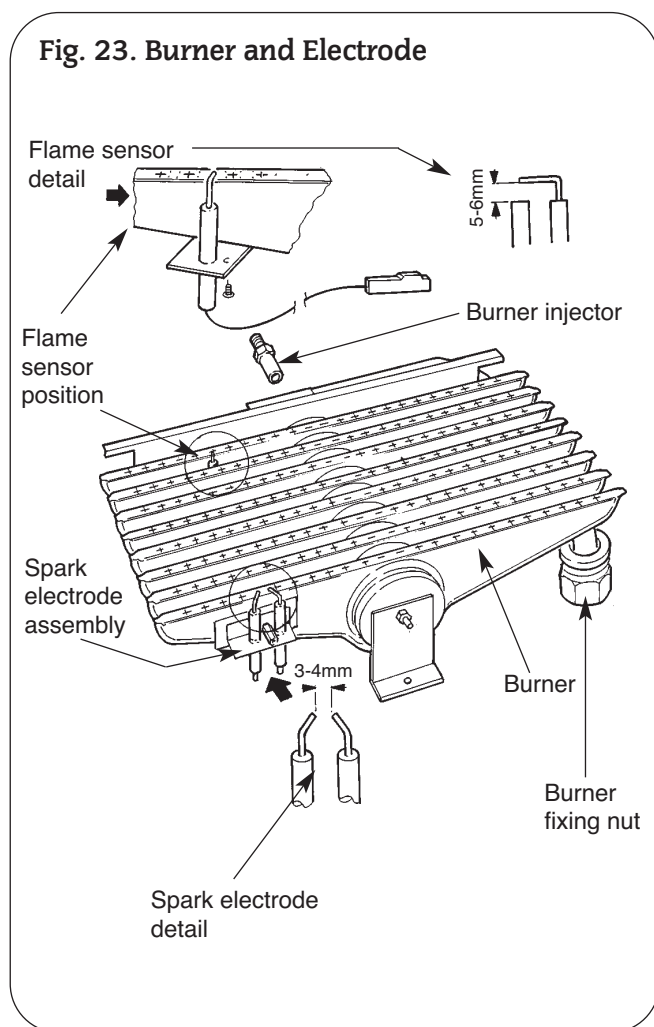
(b) **Inner Casing Cover.** Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel. Unscrew the four screws securing the cover to the casing and lift off. See Fig. 17.

(c) **Facia Panel.** Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel. Unscrew the two upper screws as shown in Fig. 17 and hinge down the facia taking care not to distort the pressure gauge capillary tube or electrical connections.

(d) **Bottom panel.** Hinge down the facia panel. Disengage the front edge of the bottom panel from the two clips and remove the bottom panel from the appliance.

**(e) Combustion Chamber Front and Sides.** Remove the inner casing cover. Slacken off to the end of the thread but do not remove the two wing nuts securing the combustion chamber. Unhook the securing rods out of the locating holes in the combustion chamber sides. Ease the combustion chamber front and side assembly clear of the appliance. Refer to Fig.22.

**(f) Burner Assembly.** Remove the combustion chamber front and sides. Pull off the two spark electrode leads and disconnect the flame sense lead at the plastic connector under the inner casing. **NOTE:** The flame sensing lead is attached to the burner. When the burner is removed ensure this lead is fed through the inner casing. Remove the grommet seal to allow the plastic connection to pass through the inner casing. Unscrew the G<sup>3/4</sup> union nut on top of the gas valve and retain the sealing washer. Unscrew the front burner fixing screw. Lift the burner and ease the union nut through the inner casing sealing grommet. Remove the burner assembly clear of the inner casing. Ensure the flame sensing lead passes through the base of the inner casing. See Fig. 23 .



#### 15. 4 SERVICE OF COMPONENTS

**Clean the Main Burner.** Brush the blade tops and mixing tube with a soft brush and check that all the flame ports are clear. Remove any blockages with a non-metallic brush. Inspect the injector and clean with a soft brush. Replace the injector if it appears damaged. Do not use a wire brush or anything likely to cause damage. Replace the spark and sense electrodes if they appear damaged.

**Clean the Gas to Water Heat Exchanger.** Cover the burner manifold hole in the combustion chamber bottom panel with a cloth. Clean the heat exchanger using a soft brush. Remove the deposits from the bottom of the combustion chamber. Do not distort any of the blades.

**Combustion Chamber Insulation.** Examine and replace any pads that are damaged. Remove any dust or deposits using a soft brush after first dampening the pads.

Reassemble the appliance in the reverse order.

Check that all components are in place and correctly fixed. Leave the cabinet front panel to be fitted after checking the operation of the appliance.

#### 15. 5 TEST THE APPLIANCE

On completion of the service and reassembly of the appliance, check for gas soundness and the correct operation of the appliance as described in Section 13-Commissioning.

Refit the cabinet front panel and reset the controls to the users requirements.

## 16. Replacement Of Parts

#### 16.1 SAFETY

Switch off the electricity and gas supplies before replacing any components. After the replacement of any components, check for gas soundness where relevant and carry out functional checks as described in Section 13 - Commissioning

#### 16.2 COMPONENT ACCESS

To replace components it is necessary to remove one or more sections of the cabinet and cover plates within the appliance as described in Section 15.3. Any 'O' ring or gasket that appears damaged must be replaced. Complete gasket and 'O' ring packs are available for the gas and water connections on the appliance. The fascia panel may also need to be hinged down as described in Section 15.3 ,c.

#### 16.3 DRAINING THE APPLIANCE

Check that the electricity supply to the appliance is turned off. Before removing any component holding water it is important that as much water as possible is removed from the appliance.

**(a) Central Heating Circuit.** Turn off the central heating flow and return valves at the appliance. Fit tubes to the drain taps on the flow and return manifolds and open the drain taps about one turn, make sure that the dust cap on the auto air vent is loosened. See Fig. 30. Close the drain taps when the flow has stopped. Be careful **not to overtighten** the drain taps. Some water will remain in the expansion vessel, pump, diverter valve, water to water and Gas to Water heat exchangers and extra care must be taken when removing these components.

**(b) Domestic Hot Water Circuit.** Turn off the mains cold supply valve at the appliance and open the lowest hot water tap. A quantity of water will remain in the Water to Water heat exchanger and the diverter valve and extra care must be taken when removing these components.

Replace any components removed from the appliance in the reverse order using new gaskets/'O' rings/sealant where necessary. Always check that any electrical connections are correctly made and that all screws are tight.

#### 16.4 COMPONENT REPLACEMENT

##### 1. Automatic Air Vent.

Remove the inner casing cover as described in Section 15.3 (b).

Drain the central heating circuit as described in Section 16.3 (a).

Remove the circlip and lift the assembly from the appliance.

Unscrew air vent from the pipe. Check the condition of the fibre washer.

Fit the replacement assembly, making sure the 'O' ring is in good condition.

Ensure that the circlip is correctly fitted and the dust cap is

loosened.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

### 2. Overheat Thermostat.

Check that the electricity supply to the appliance is turned off.

Remove the inner casing cover as described in Section 15.3 (b).

Carefully pull off the two wires from the thermostat head.

Undo the two M3 screws and remove from the appliance.

Fit the replacement thermostat in the reverse order ensuring that some heat sink compound is between the thermostat and the plate.

**3. Gas to Water Heat Exchanger.** Check that the electricity supply to the appliance is turned off.

Drain the central heating circuit as described in Section 16.3 ,a.

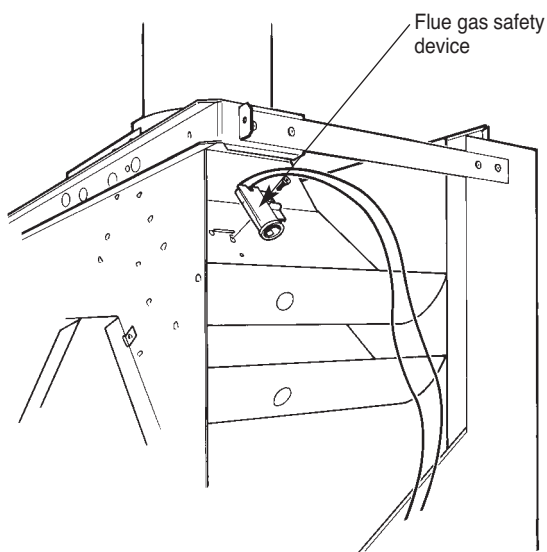
Remove the inner casing cover, overheat thermostat, central heating sensor, burner and automatic air vent assembly as described in Sections 15.3 ,b and f, 16.4 ,1, 16.4 ,2 and 16.4 ,11. Pull down the flow pipe to free it from the heat exchanger. Disconnect the return pipe from the return manifold, turn the pipe to clear the manifold and pull down the pipe to free it from the heat exchanger. The heat exchanger can now be pulled down free of the retaining clips securing it to the flue hood.

Take care that the rear insulation pad does not drop forwards onto the burner.

Fit the replacement heat exchanger in the reverse order ensuring that both the "O" rings are correctly fitted and lubricated and a layer of heat sink compound is on both the thermostats.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**Fig. 24. Flue gas safety device.**



### 4. Flue Gas Safety Device. Refer to Fig. 24.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel as described in Section 15.3, a. Carefully separate the two connections joining the flue gas safety device to the wiring harness. Remove the screw securing the device to the draught diverter and remove.

Fit the replacement flue gas safety device in the reverse order ensuring that the device is in the correct location on the draught diverter.

### 5. Combustion Chamber Insulation. Refer to Fig. 25.

Check that the electricity supply to the appliance is turned off.

Drain the central heating circuit as described in Section 16.3, a.

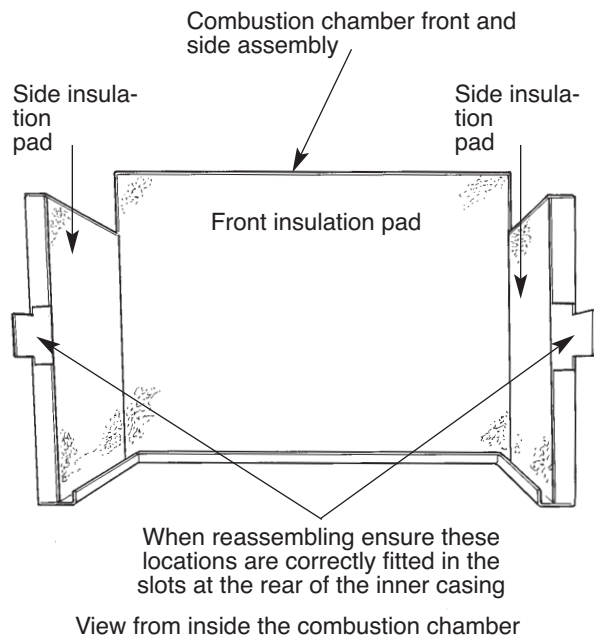
Remove the inner casing cover, combustion chamber front and sides, burner, and Gas to Water heat exchanger as described in

Sections 15.3 ,b, e and f, and 16.4 ,6. Remove the fibre insulation pads from the combustion chamber side, rear, and front sections. To avoid the risk of fine particles dampen the pads before removal.

Fit the replacement pads in the reverse order taking care not to damage them.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**Fig. 25. Combustion Chamber Insulation**



### 6. Burner. Refer to Fig. 23.

Check that the electricity and gas supplies to the appliance are turned off.

Remove the burner assembly as described in Section 15.3 ,f.

Fit the replacement burner in the reverse order taking care not to damage the electrode leads.

### 7. Burner Injector. Refer to Fig. 23.

Remove the burner as described in Section 15.3 ,f.

Unscrew the brass injector from the burner.

Fit the replacement injector in the reverse order.

### 8. Spark Electrode Assembly. Refer to Fig. 23.

Remove the combustion chamber front and sides as described in 15.3 ,e.

Carefully pull off the two electrode leads,

Undo the M4 extended nut and remove the spark electrode assembly from the burner.

Fit the replacement electrode in the reverse order, checking that the spark gap is 3 to 4mm.

### 9. Flame Sensor. Refer to Fig. 23.

Remove the burner as described in Sections 15.3 ,f and 16.4 ,6.

Undo the M3 screw and remove the sense electrode from the burner.

Fit the replacement electrode in the reverse order, checking that the sense gap is 5 to 6mm.

### 10. Gas Valve. Refer to Fig. 20.

Check that the electricity and gas supplies to the appliance are turned off.

Hinge down the fascia panel into the servicing position as described in Section 15.3 ,c.

Undo the two 3/4 inch nuts on the gas valve and the two M4 screws on the gas valve bracket and withdraw the valve.

Whilst supporting the valve carefully pull off the three electrical solenoid plug connections.

Fit the replacement gas valve in the reverse order ensuring the sealing washers are correctly fitted.

Turn on the gas supply and check for soundness.

**To set the burner pressure.** Refer to Fig. 23.

The minimum and maximum burner pressure must be set after a new gas valve has been fitted.

Follow the procedure described in Section 13.4 - Appliance Operation.

**The minimum burner pressure must be set first, since maximum is adjusted simultaneously.**

Start the appliance in the domestic hot water mode as described in Section 13.4. - Appliance Operation.

Turn the gas valve switch on the rear of the facia to minimum. Refer to Fig. 27.

Adjust the minimum pressure screw on the gas valve to give a burner pressure of 2.0mbar for natural gas or 5.5mbar for propane.

Turn the gas mode switch on the rear of the facia to maximum.

Adjust the maximum pressure screw on the gas valve to give a pressure of 13.2mbar for natural gas or 35.5mbar for propane.

Turn the gas mode switch on the rear of the facia to normal.

After completing the adjustments, check the minimum and

maximum pressures and adjust as necessary.

Ensure the appliance lights in the central heating mode.

It should not be necessary to alter the central heating potentiometer setting when the gas valve only is replaced and the minimum and maximum pressures are set.

**11. Central Heating Sensor.** Refer to Fig. 22.

Remove the inner casing cover as described in Section 15.3 ,b.

Check that the electricity supply to the appliance is turned off.

Carefully pull off the two leads from the sensor.

Pull off the sensor and spring retaining clip from the pipe.

Fit the replacement sensor in reverse order with a layer of heat sink compound between the faces. Refit the leads.

**12. Domestic Hot Water Sensor.** Refer to Fig. 29.

Check that the electricity supply to the appliance is turned off.

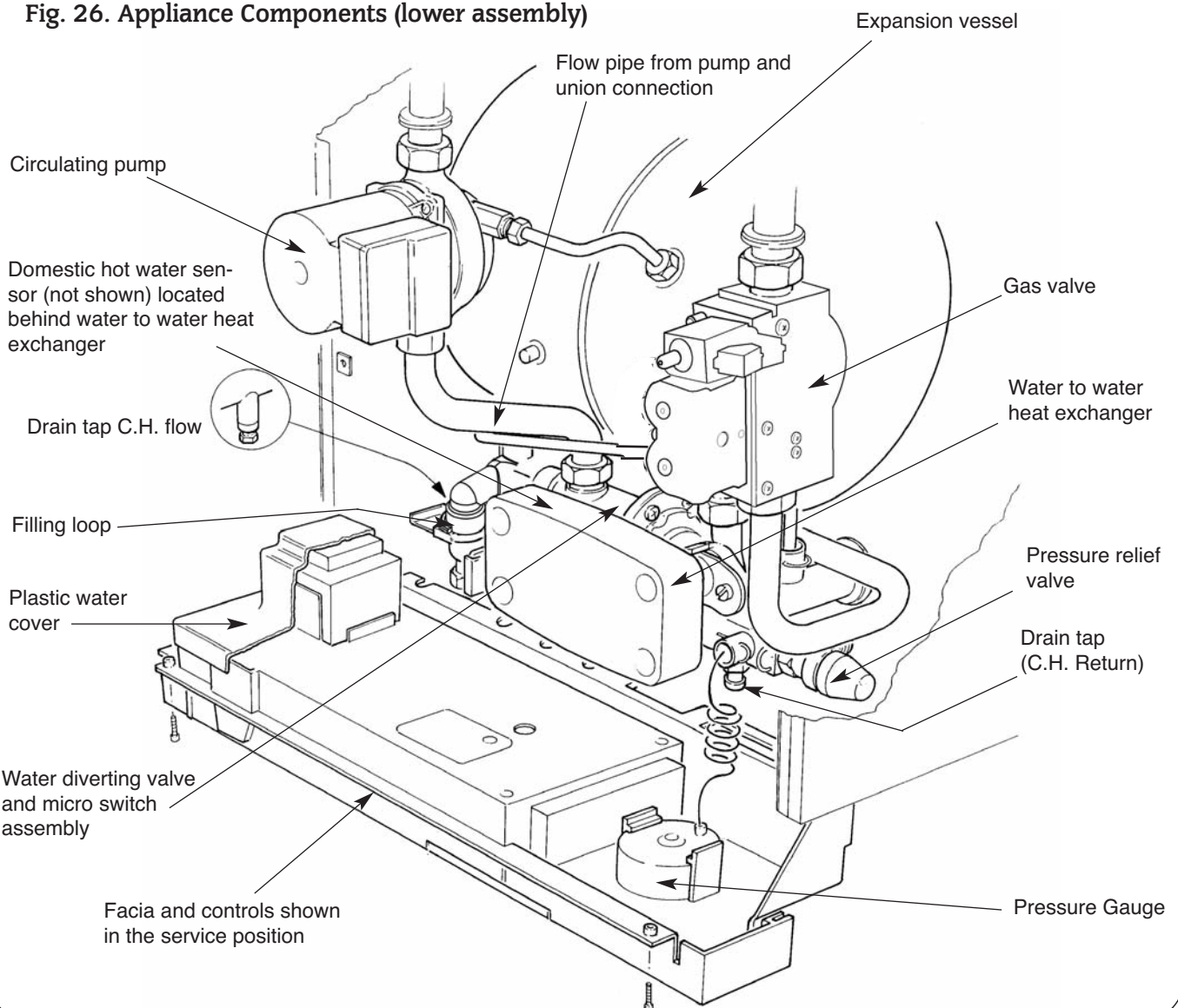
Hinge the facia panel into the servicing position as described in Section 15.3(c).

Carefully pull off the two leads from the sensor.

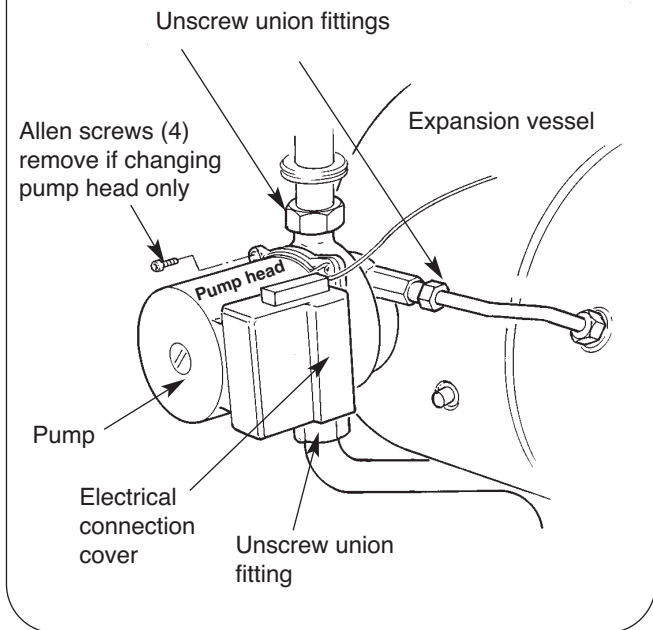
Undo and remove the screw, pull off the sensor and spring retaining clip from the pipe.

Fit the replacement sensor in the reverse order ensuring a layer of heat sink compound is between the faces. Refit the leads.

**Fig. 26. Appliance Components (lower assembly)**



**Fig. 27. Circulating pump**



**13. Circulating Pump.** Refer to Figs. 27.

Check that the electricity supply to the appliance is turned off. Drain the central heating circuit as described in Section 16.3, a. Hinge the fascia panel into the servicing position as described in Section 15.3, c.

Undo the two union nuts and the pipe to the expansion vessel, remove the pump from the pipe-work. Support the pump and remove the electrical cover.

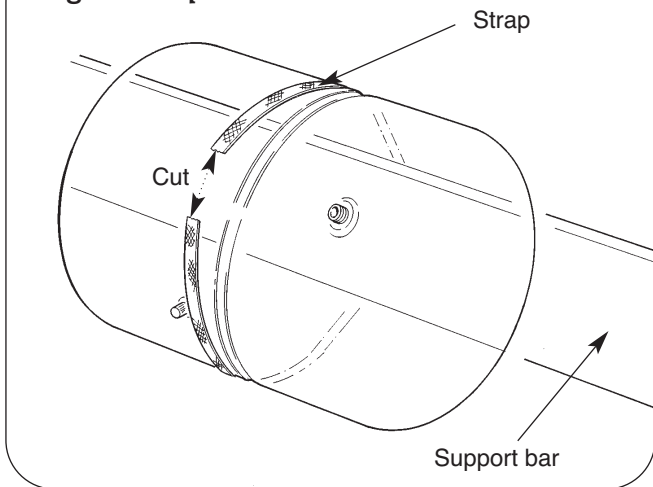
Disconnect the electrical wires taking note of their positions. Fit the replacement pump in the reverse order using new sealing washers.

**Alternatively** replace the pump head only by removing the four Allen screws on the pump, remove the head and support whilst removing the electrical connections. Refit the new head.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**NOTE:** The direction of flow should be downwards. The speed should always be set to maximum.

**Fig. 28. Expansion Vessel**



**14. Expansion Vessel.** Refer to Figs. 28.

Drain the central heating circuit as described in Section 16.3(a). Hinge the fascia panel into the servicing position as described in Section 15.3(c).

Remove gas to water heat exchanger, water to water heat exchanger and pump as described in 16.4, 3, 19, and 13 and remove the vessel.

Fit the replacement vessel in the reverse order. Open the valves and fill and re-pressurise the system as described in Section 13.2

**15. Pressure Relief Valve.** Refer to Fig. 18, 30.

Drain the central heating circuit as described in Section 16.3, a. Hinge down the fascia panel as described in Section 15.3, c. Remove the bottom panel as described in Section 15.3, d. Pull out the retaining clip and remove the pressure gauge connection. Undo the discharge pipe connection and remove the valve taking care not to distort the pipework.

Fit the replacement valve in reverse order. Reconnect the discharge pipe.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**16. Water Diverting Valve Micro Switch Assembly.**

Refer to Figs. 29, 30.

Check that the electricity supply to the appliance is turned off. Hinge down the fascia panel as described in Section 15.3(c). Remove the bottom panel as described in Section 15.3(d) Using a pair of fine nosed pliers, pull the circlip off and remove the micro switch assembly from the valve. Remove the black cover and carefully pull off the connections from the terminals on the micro switches. Refer to Fig. 29.

Withdraw the switch assembly from the appliance.

Fit the replacement micro switch assembly in the reverse order.

**17. Water Diverting Valve.** Refer to Figs. 29, 30.

Check that the electricity supply to the appliance is turned off. Drain the central heating and domestic hot water circuits as described in Sections 16.3, a and b.

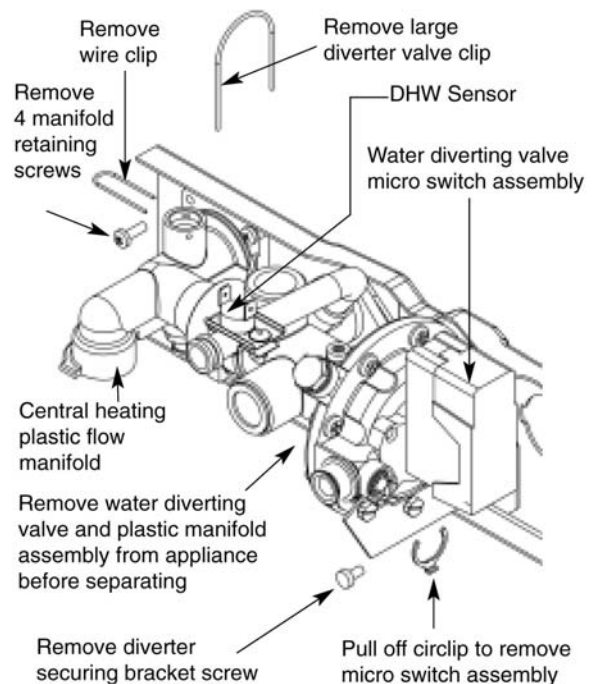
Hinge down the fascia panel into the Servicing Position as described in Section 15.3, c.

Remove the bottom panel, filling loop, water to water heat exchanger and micro switch assembly as described in Section 15.3, d, and Sections 16.3, 16, 19 and 22.

Pull off the large wire clip locating the water diverting valve to the central heating plastic flow manifold on the left hand side of the appliance.

Remove the wire clip securing the copper by-pass pipe to the flow manifold.

**Fig. 29. Water Diverting Valve and Micro Switch Assembly.**



Retain the wire clips.

Carefully ease the by-pass pipe out of the manifold and allow the pipe to swing forwards to clear the manifold connection.

Remove the screw securing the bracket, located at the right hand end of the water diverting valve, to the appliance casing.

Remove the four screws located at the left hand side securing plastic manifold to the appliance.

Remove the water diverting valve and plastic manifold assembly clear of the appliance.

Ease the water diverting valve out of the plastic manifold.

Remove the securing bracket from the valve and the water filter from the valve cold water inlet.

Retain the plastic manifold, fixing screws, support bracket and water filter.

Discard the water diverting valve.

Reassemble the original support bracket, water filter and new 'O' ring seals to the replacement valve.

Lubricate the 'O' ring seal and push the plastic flow manifold onto the valve.

Reassemble the water diverting valve and plastic manifold assembly to the appliance in the reverse order.

Ensure all 'O' ring seals and fibre washers are renewed and replaced correctly and the 'O' rings are lubricated.

Reassemble the appliance in the reverse order.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**18. Inlet Water Filter.** Refer to Fig. 30.

Check that the electric supply to the appliance is turned off.

Drain the central heating and domestic hot water circuits as described in Sections 16.3, a and b.

Hinge down the fascia panel into the servicing position as described in Section 15.3, c.

Follow the procedures as described in Section 15.3,17 and remove the water diverting valve from the appliance.

Remove the water filter from the cold water inlet.

Discard or clean the filter.

Fit the replacement filter (push fit) in the reverse order.

Reassemble the appliance in the reverse order following the procedure described in Section 15.3, 17.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**19. Water to Water Heat Exchanger.** Refer to Fig. 30.

Check that the electricity supply to the appliance is turned off.

Drain the central heating and domestic hot water circuits as described in Sections 16.3, a and b.

Hinge down the fascia panel into the servicing position as described in Section 15.3, c.

Remove the bottom panel as described in Section 15.3, d.

Remove the filling loop as described in Section 15.4, 22. Undo the diverter valve connection. Remove the bolt and circlip and pull the heat exchanger forward and away from the appliance.

Fit the replacement heat exchanger in the reverse order.

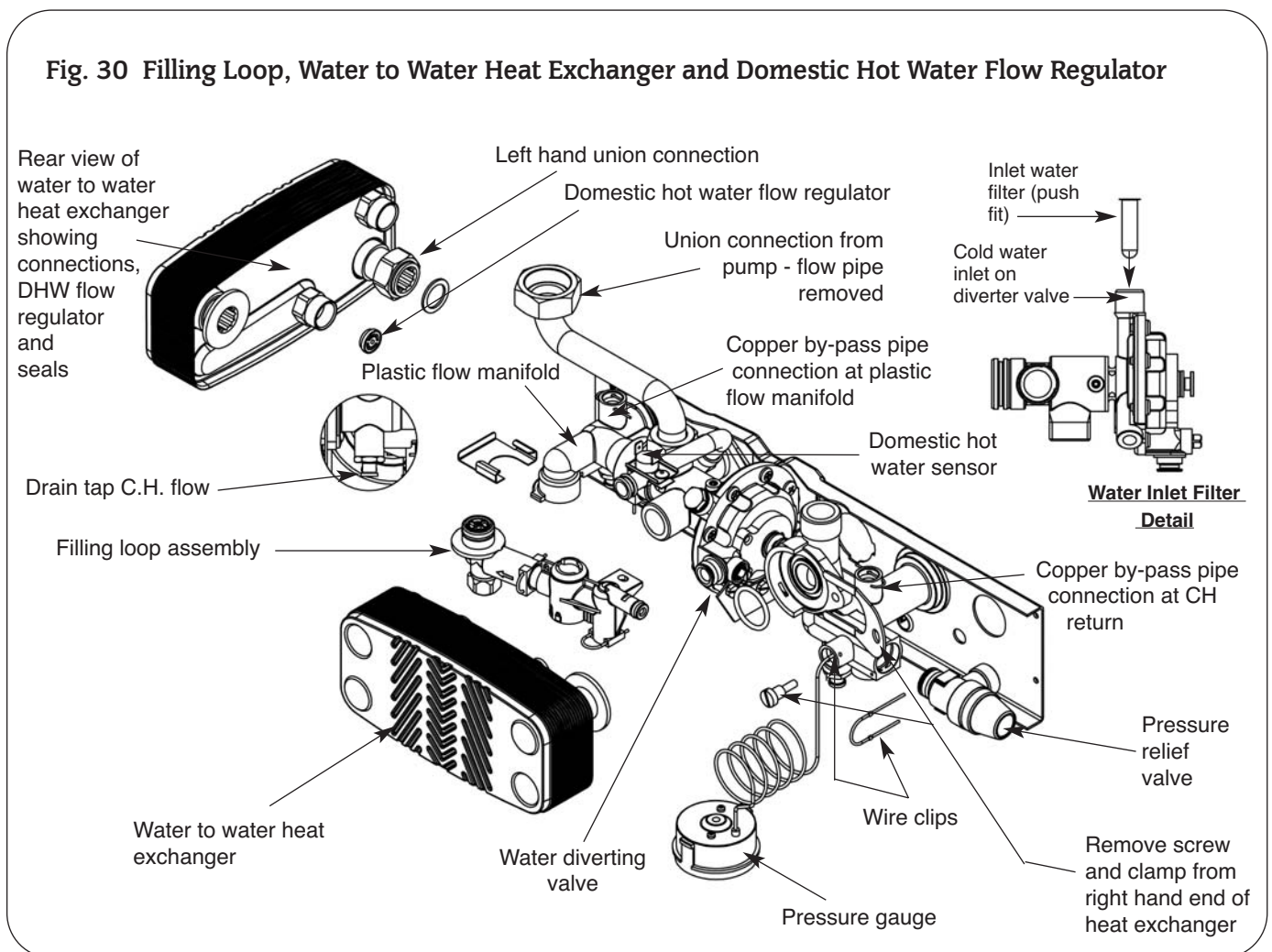
Open the valves and fill and re-pressurise the system as described in Section 13.2

**20. Domestic Hot Water Flow Restrictor.**

Remove the water to water heat exchanger assembly as described in Section 15.4, 19.

The plastic flow restrictor is located within the brass housing on the heat exchanger. Refer to Fig. 30.

Fit the replacement flow restrictor and reassemble in the reverse order ensuring the fibre washers and 'O' rings are in place.



**21. Pressure Gauge.** Refer to Figs. 30,31.

Check that the electricity supply to the appliance is turned off.  
Drain the central heating circuit as described in Section 16.3, a.  
Hinge down the fascia panel into the servicing position as described in section 15.3, c.

Remove circlip and pull out the capillary sensing bulb in the return manifold.

Prise back the retaining clips securing the gauge to the fascia panel and remove.

Fit the replacement gauge in the reverse order ensuring the "O" ring is in place.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**22. Filling Loop.** Refer to Fig.30.

Check that the electricity supply to the appliance is turned off.  
Drain the central heating circuit as described in Section 16.3, a.

Hinge down the fascia panel into the servicing position as described in section 15.3, c.

Remove the screw securing the filling loop to the underside of the water diverting valve.

Remove the clip retaining the filling loop to the plastic flow manifold.

Remove the wire clip joining the two sections of the filling loop and slide the air gap section in the direction of the arrow.

Remove from the appliance.

Fit the replacement assembly in the reverse order.

Open the valves and fill and re-pressurise the system as described in Section 13.2.

**23. Control Board.** Refer to Fig. 31.

Check that the electricity supply to the appliance is turned off.

Remove the three screws fixing the fascia bottom panel to the fascia. Remove the fascia bottom panel. Retain the panel and screws.

Carefully pull off all the connectors. Disconnect the mains supply lead at terminal ST 12 and the earth connection at the back.

Pull off the three plastic control knobs. Take care not to damage the knobs when pulling off.

Retain the knobs.

Hinge down the fascia panel into the Servicing Position as described in Section 15.3, c.

Remove the plastic water cover.

Remove the four corner screws on the back of the fascia and separate the metal back panel from the plastic fascia.

Ease off the two spark electrode lead connections.

Release the plastic catch at each of the four mounting posts pulling the control board forwards approximately 3mm to prevent the plastic catch from returning.

Pull the board off the remainder of the mounting posts until it is free.

Unplug the transformer from rear of the board. Discard the control board retain the transformer.

Plug in the transformer to the replacement control board. The transformer will fit in one direction only.

Locate the replacement control board over the four mounting posts and push back squarely until the plastic catch on the end of each post clicks into place.

Reassemble in the reverse order and ensure:

i) the spark electrode leads are re-connected. Polarity is not important.

ii) the connectors are fitted to the correct terminals.

Connectors are not interchangeable and will only fit the terminals from which they were removed.

Reassemble the fascia panel and fascia bottom panel in the reverse order. When replacing the control knobs ensure the knob with the shortest shaft is fitted to the left hand control position.

**24. Transformer.** Refer to Fig. 31.

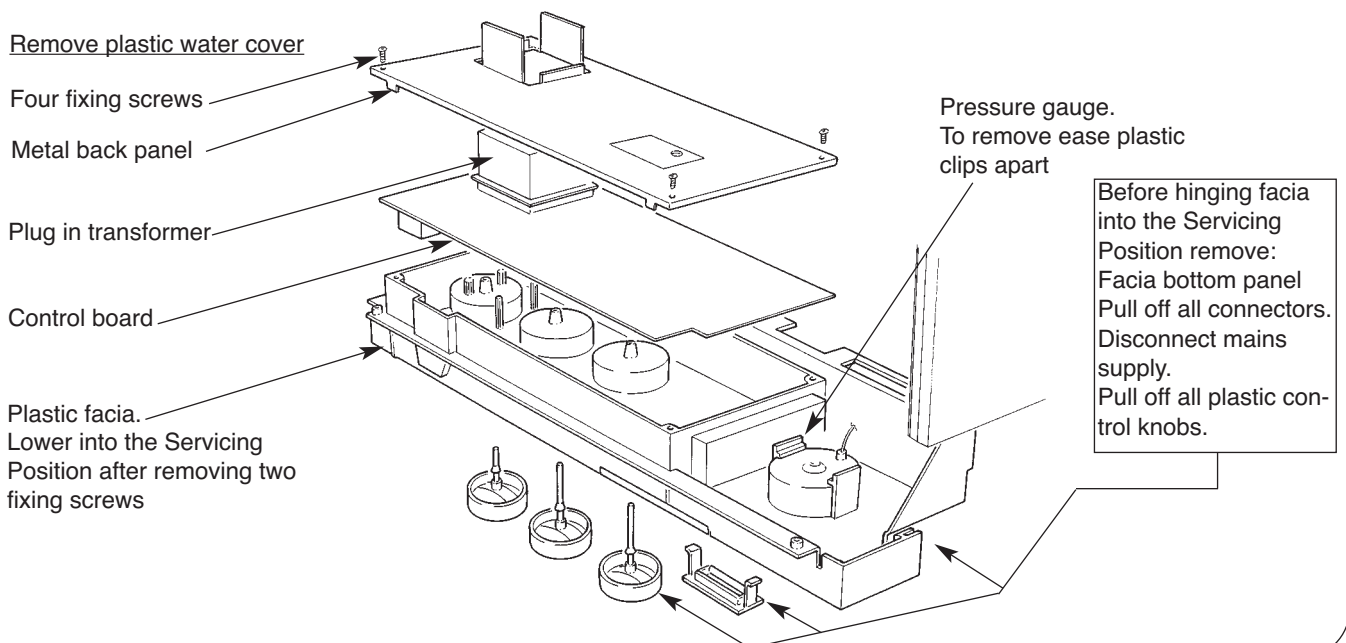
Check that the electricity supply to the appliance is turned off.

Remove the control board as described in Section 15.4, 23.

Pull the transformer from the back of the control board.

Fit the replacement transformer in the reverse order.

**Fig. 31. Rear of Fascia in Servicing Position, Control Board and Transformer.**



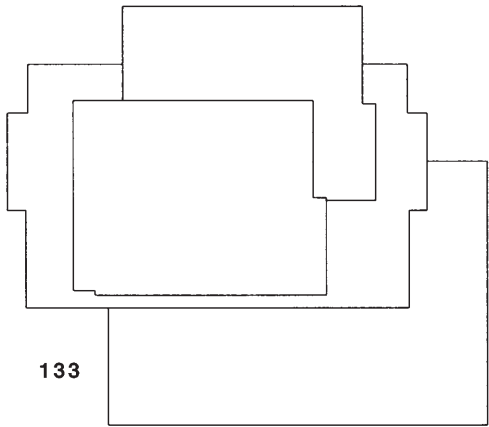
## 17. Short Parts List

Key No.	G.C. No.	Part	Manufacturer's Reference	Qty	WHS Part No.
26	E80 450	Gas Valve – Natural Gas	Dungs BM771 SL040	1	8 716 102 673 0
26	E80 451	Gas Valve – Propane	Dungs BM771 SL040	1	8 716 102 868 0
78	375 695	Burner – Natural Gas	Aeromatic, Ref. AC 23/05 3582	1	8 716 142 602 0
78	173 012	Burner – L.P.G.	Aeromatic, Ref. AC23/05 3583	1	8 716 142 600 0
80	173 091	Burner Injector – Natural Gas	Stereomatic, Type 7, 4.5mm dia.	1	8 716 140 208 0
80	E00-741	Burner Injector – L.P.G.	Stereomatic, Type 7, 2.78mm dia.	1	8 716 140 209 0
81	375 697	Spark Electrode Assembly	Bucleuch, Ref. BE/3462/SI	1	8 716 142 100 0
82	E01 612	Flame Sensor	Bucleuch, Ref. BE/3461/SI	1	8 716 120 345 0
95	299 515	Ignition Harness	Bucleuch, Ref. BE/3469/SI	1	8 716 120 229 0
61	299 352	Gas to Water Heat Exchanger	Giannoni, Ref. PR22 323 003. D2107	1	8 716 142 800 0
68	E00 716	Automatic Air Vent	Intermes, Ref. 02.05.010	1	8 716 140 500 0
85	299 506	System Pressure Gauge	Cewal, Spec. D2111	1	8 716 142 300 0
40	375 699	Pressure Relief Valve	Caleffi, Ref. 312439	1	8 716 142 404 0
29	173 006	Circulating Pump	Grundfoss, Ref. 50 50 6601	1	8 716 143 100 0
25	173 001	Expansion Vessel	Zilmet, Ref. 301010	1	8 716 142 500 0
42	299 353	Water to Water Heat Exchanger	Giannoni, Ref. PVW 12 E. D2108	1	8 716 142 900 0
34	173 005	Diverter Valve	Giannoni, Ref. V37/OM/I/F/4/A. D2109	1	8 716 142 401 0
104	379 215	DHW Flow Restrictor	Type E - White 8 Litre	1	8 716 141 054 0
105	378 416	Domestic Water Filter	MPM, V3326	1	8 716 148 400 0
109	E01 840	Charging Link Assembly	WHS	1	8 716 120 320 0
84	173 014	Circuit Board – OF/BF	Junkers Bosch, Type Heatronic II KE	1	8 748 300 220 0
96	299 516	Transformer	ERA, Ref. BV 066-0188.0	1	8 747 201 248 0
60	375 696	Thermister Sensor	Elmwood, Ref. 6655 - 9003 - 5	2	8 716 142 302 0
62	173 015	Overheat Thermostat	Elmwood, Ref. 2455 R - 98 - 789	1	8 716 142 303 0
101	173 017	Flue Spillage Thermostat – OF	Industrietechnik	1	8 716 120 238 0
133	299 354	Combustion Chamber Insulation Pack	WHS	1	7 716 192 204 0
134	299 355	Fibre Washer Pack	WHS	1	7 716 192 205 0
135	299 356	'O' Ring Pack	WHS	1	7 716 192 207 0
136	299 357	Fuse Pack	WHS	1	7 716 192 206 0

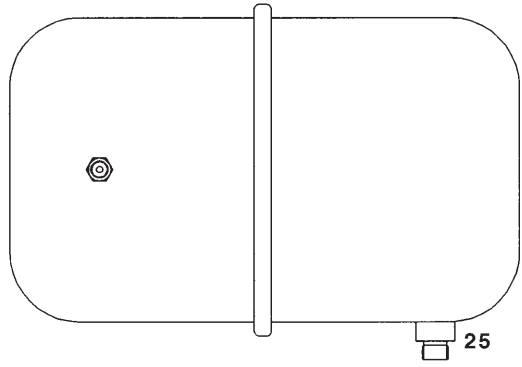
### Accessories For 24CDi OF

G.C.No.	Part	WHS Part No.
299 361	Digital Single Channel Programmer	7 716 192 003
299 360	Mechanical Single Channel Programmer	7 716 192 002
E01 053	Digistat CD (Radio Controlled Thermostat)	7 716 192 006
E00 755	OF Open Vent Kit	7 716 192 106
	Pre-system Filling Loop	7 716 192 102
	Mini Expansion Vessel	7 716 192 105

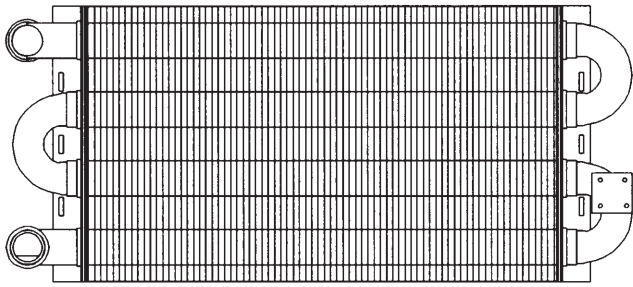




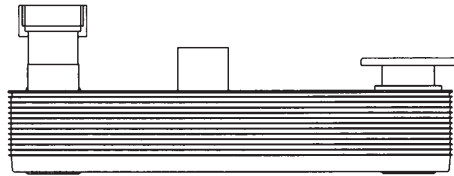
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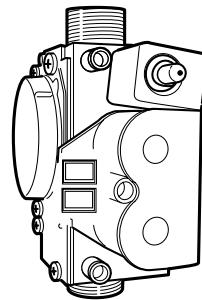
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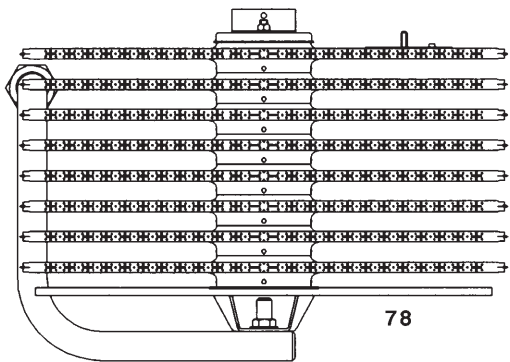
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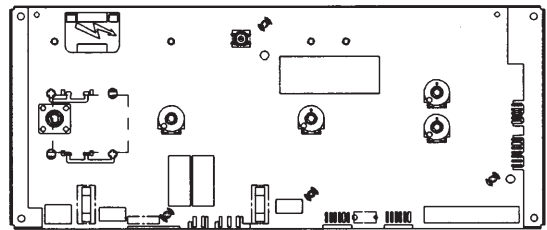
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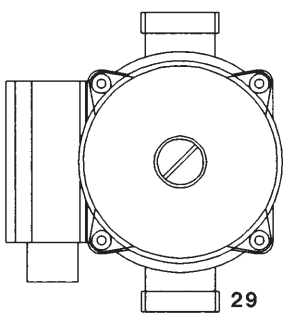
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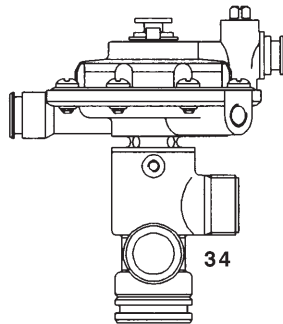
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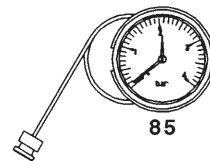
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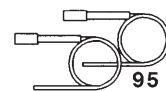
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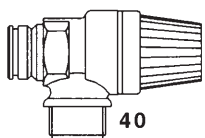
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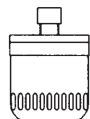
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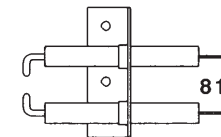
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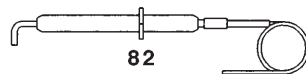
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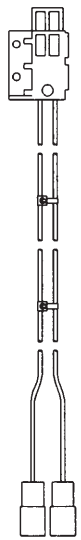
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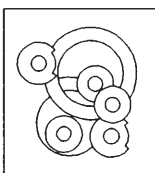
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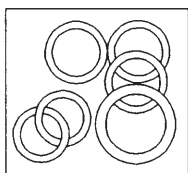
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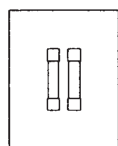
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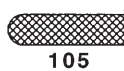
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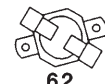
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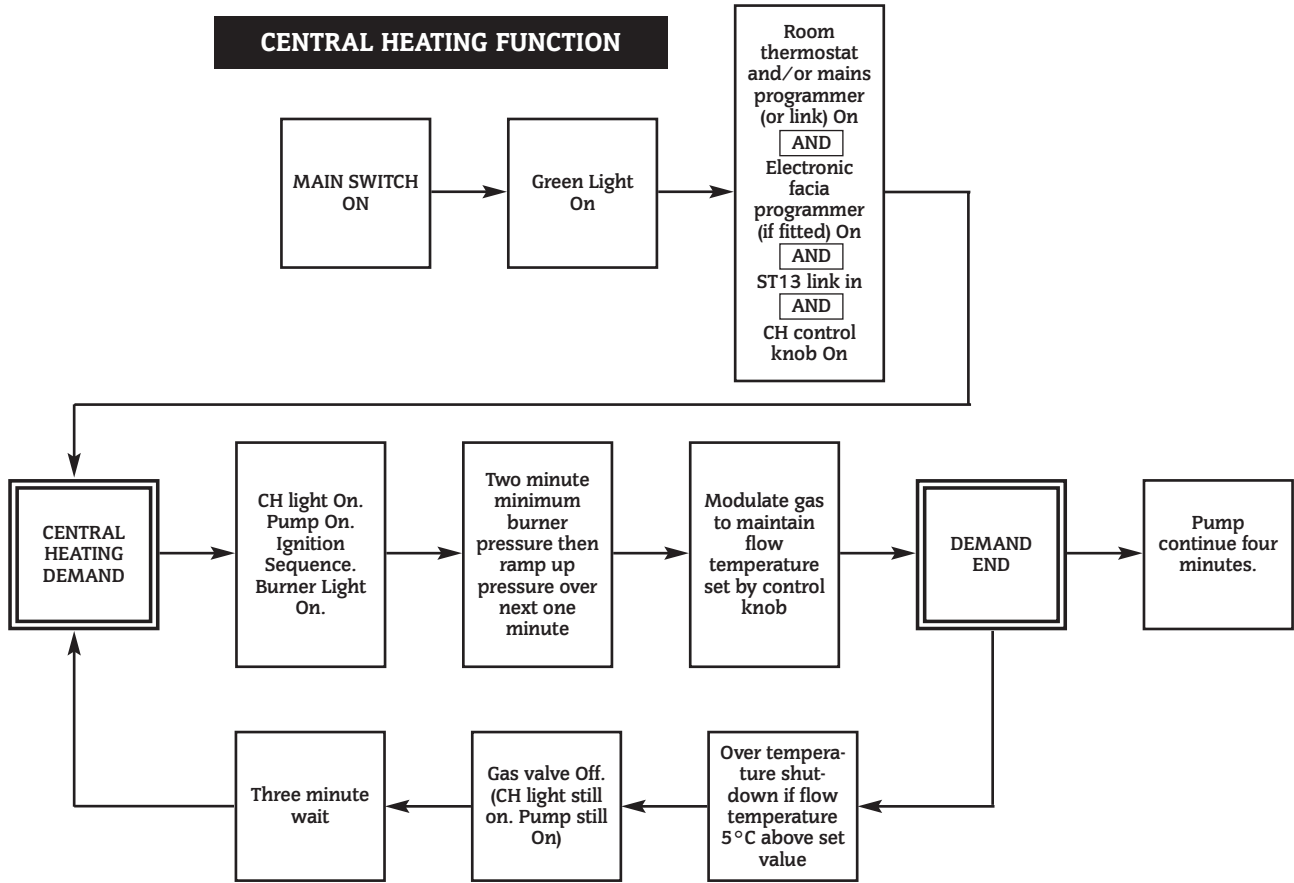
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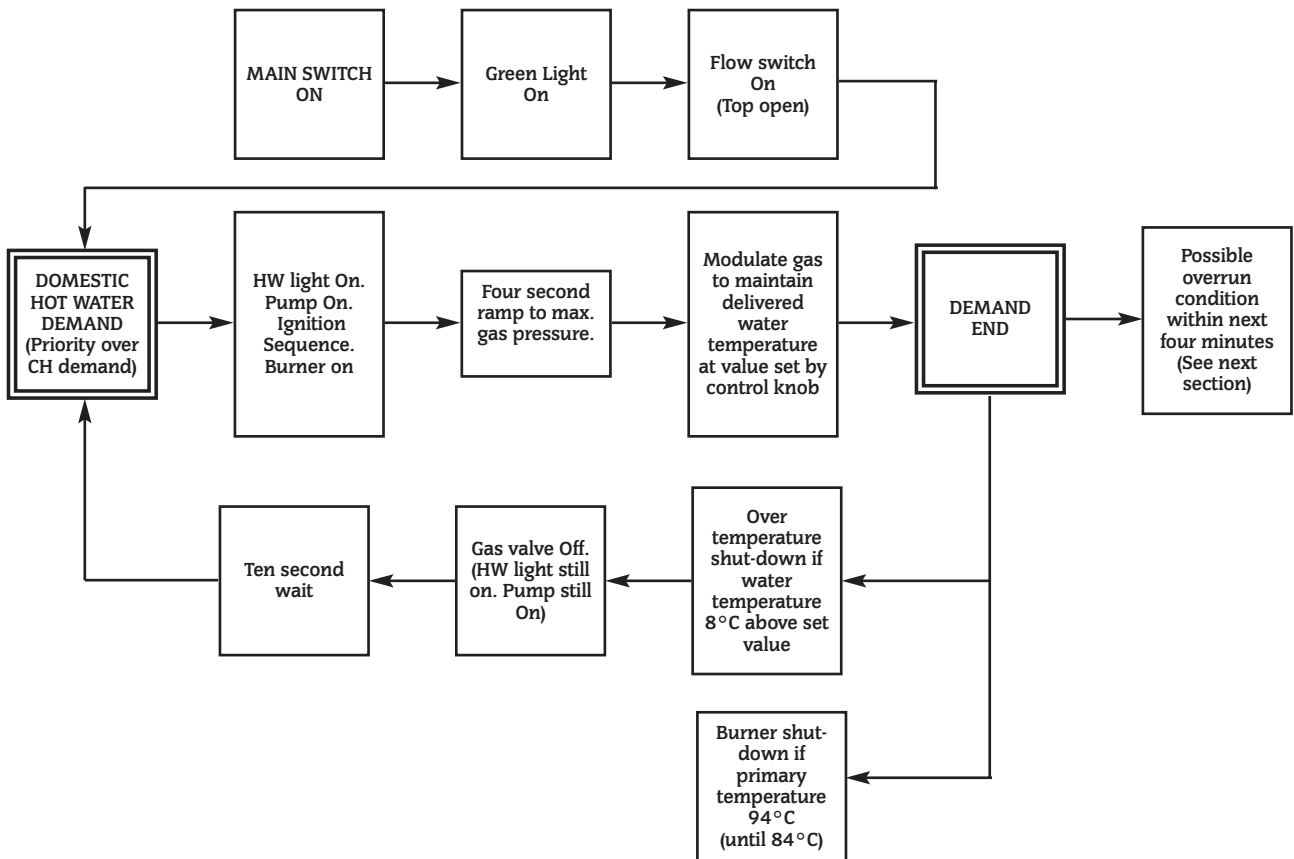
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# 18. Operational Flow Diagrams

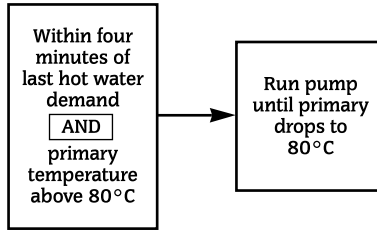
## CENTRAL HEATING FUNCTION



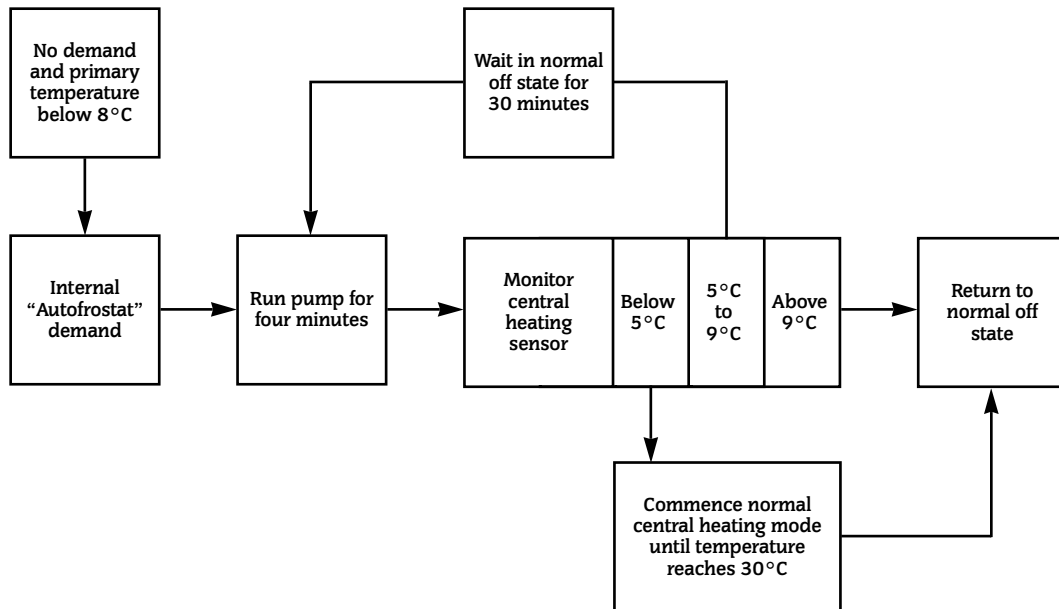
## DOMESTIC HOT WATER FUNCTION



## OVERRUN FUNCTION



## AUTOFROSTAT FUNCTION



## 19. Fault Finding

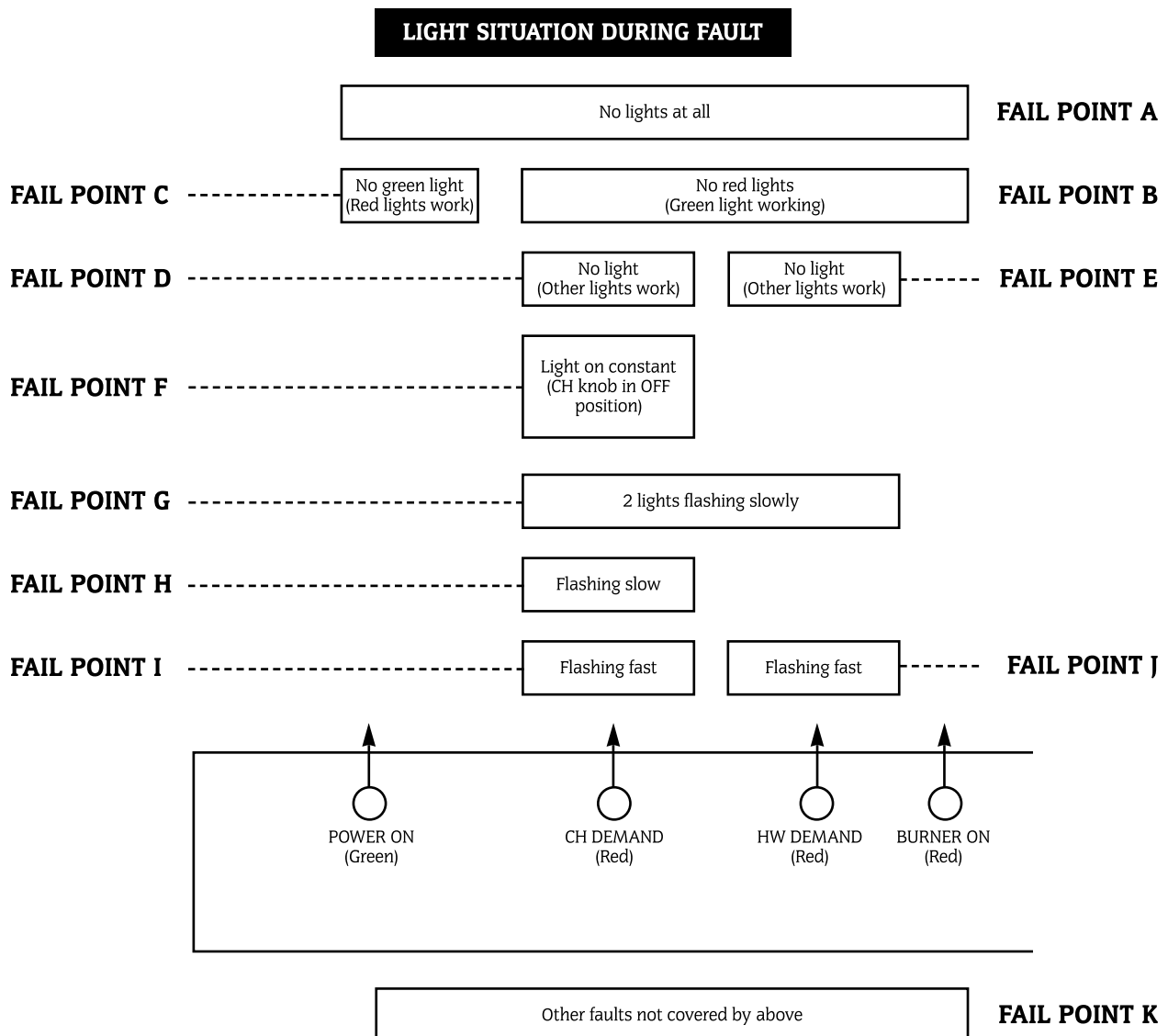
**Note:** This fault-finding information is for guidance only. Worcester Heat Systems cannot be held responsible for costs incurred by persons not deemed to be competent.

The electronic control system for this boiler incorporates four lights on the facia. These are used to show normal operating status. But as a secondary function, by flashing, they can also be used to help provide fault diagnostics. Therefore, with individual or groups of lights being permanently off, on or flashing, every normal fault can be identified.

To use the fault finding system, select a box below which represents the light situation during your fault. Then refer to the appropriate following section. This fault-finding system assumes that the appliance has been operating correctly until the time of failure.

### PRELIMINARY CHECKS

Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure. On completion of the Service/Fault-Finding task which has required the breaking and remaking of electrical connections, check (a) EARTH CONTINUITY, (b) SHORT CIRCUIT CHECK, (c) POLARITY and (d) RESISTANCE TO EARTH.

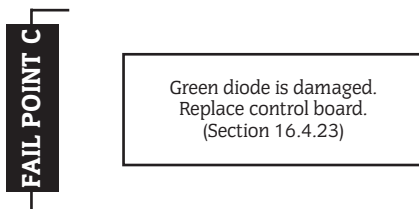
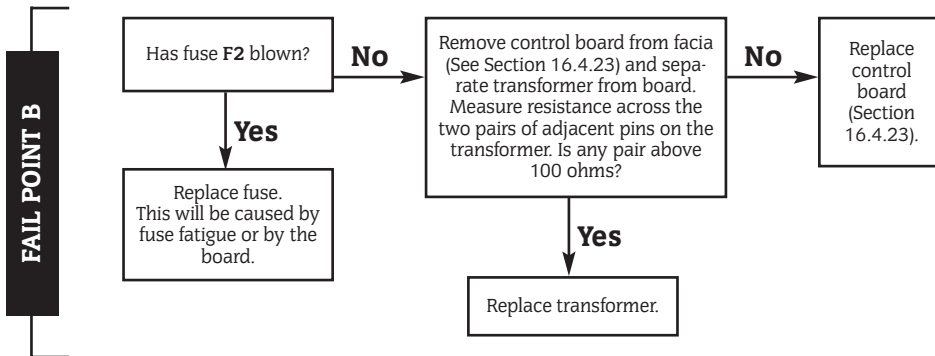
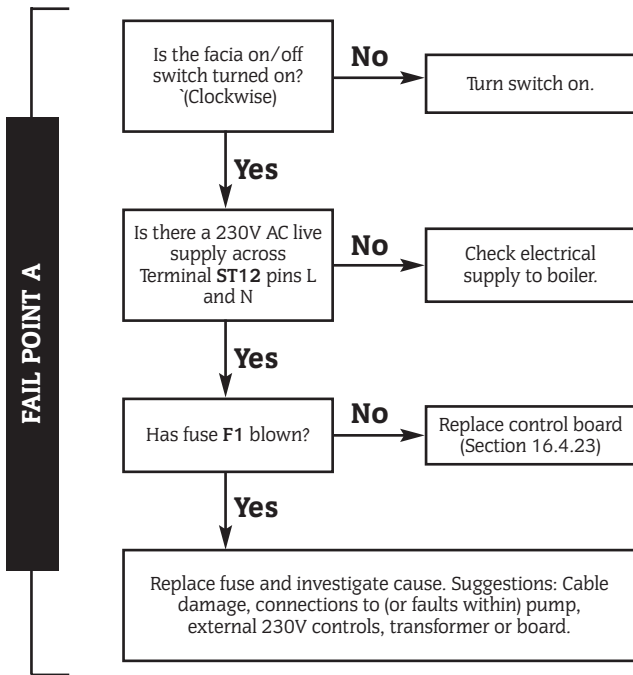


**Note:**

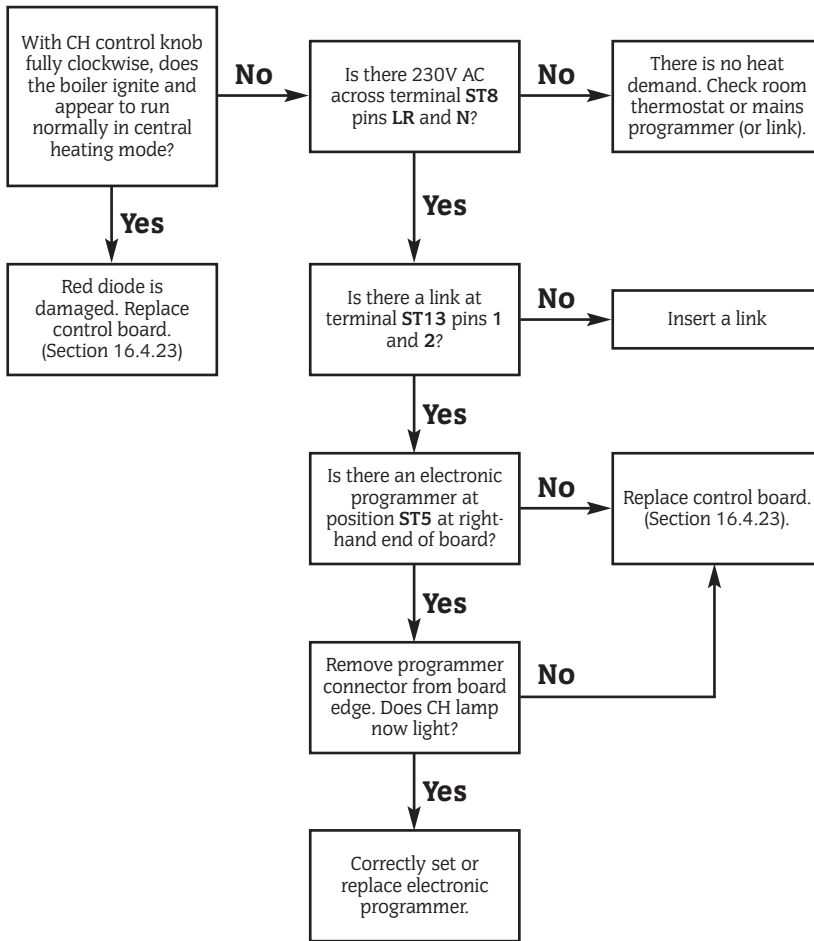
Slow flash is once per second, fast flash is five times per second.

Slow flash can only be cleared by using the facia reset button (press for at least one second).

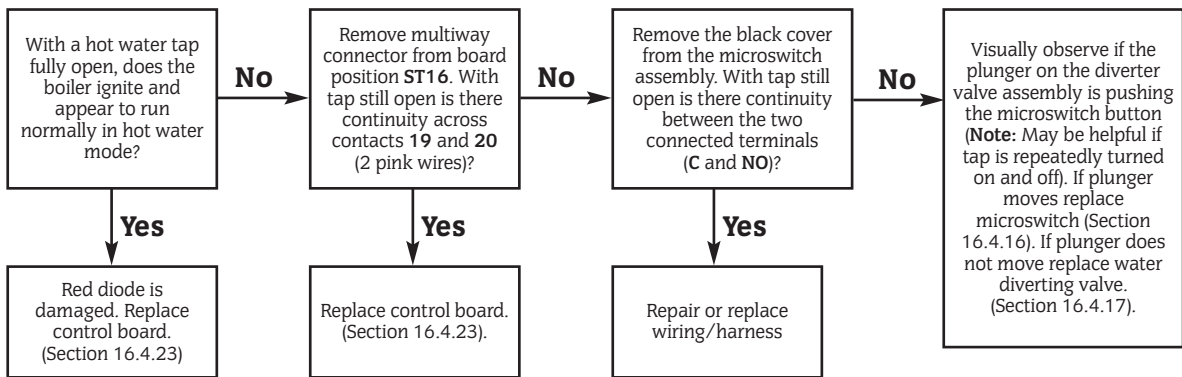
Fast flash is cleared by removing fault and/or main switch off/on.



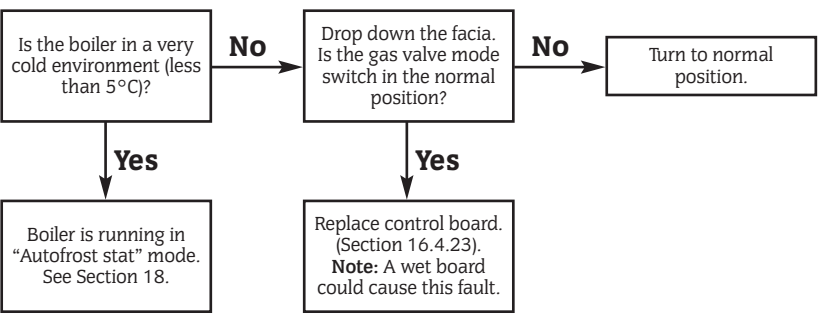
**FAIL POINT D**



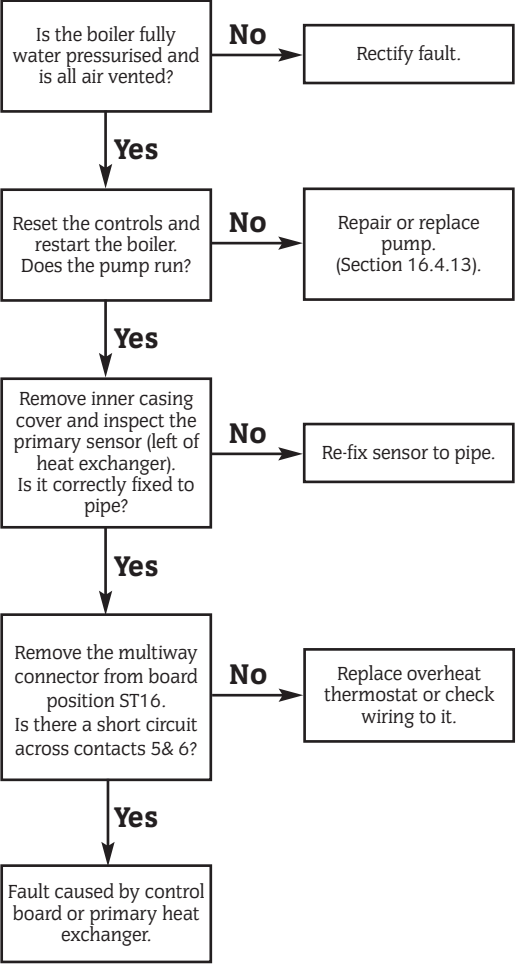
**FAIL POINT E**



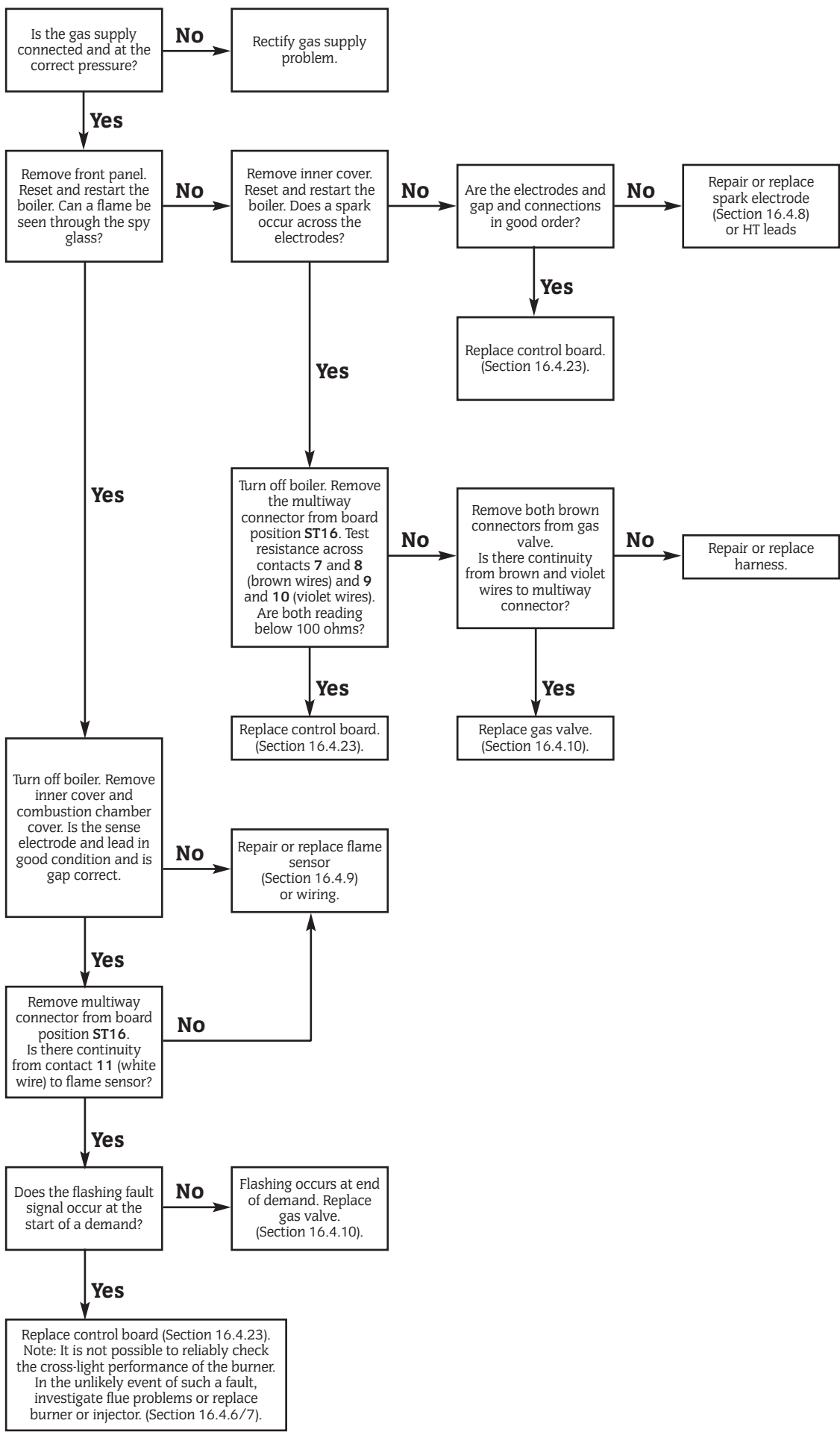
**FAIL POINT F**



**FAIL POINT G "Primary Overheat"**

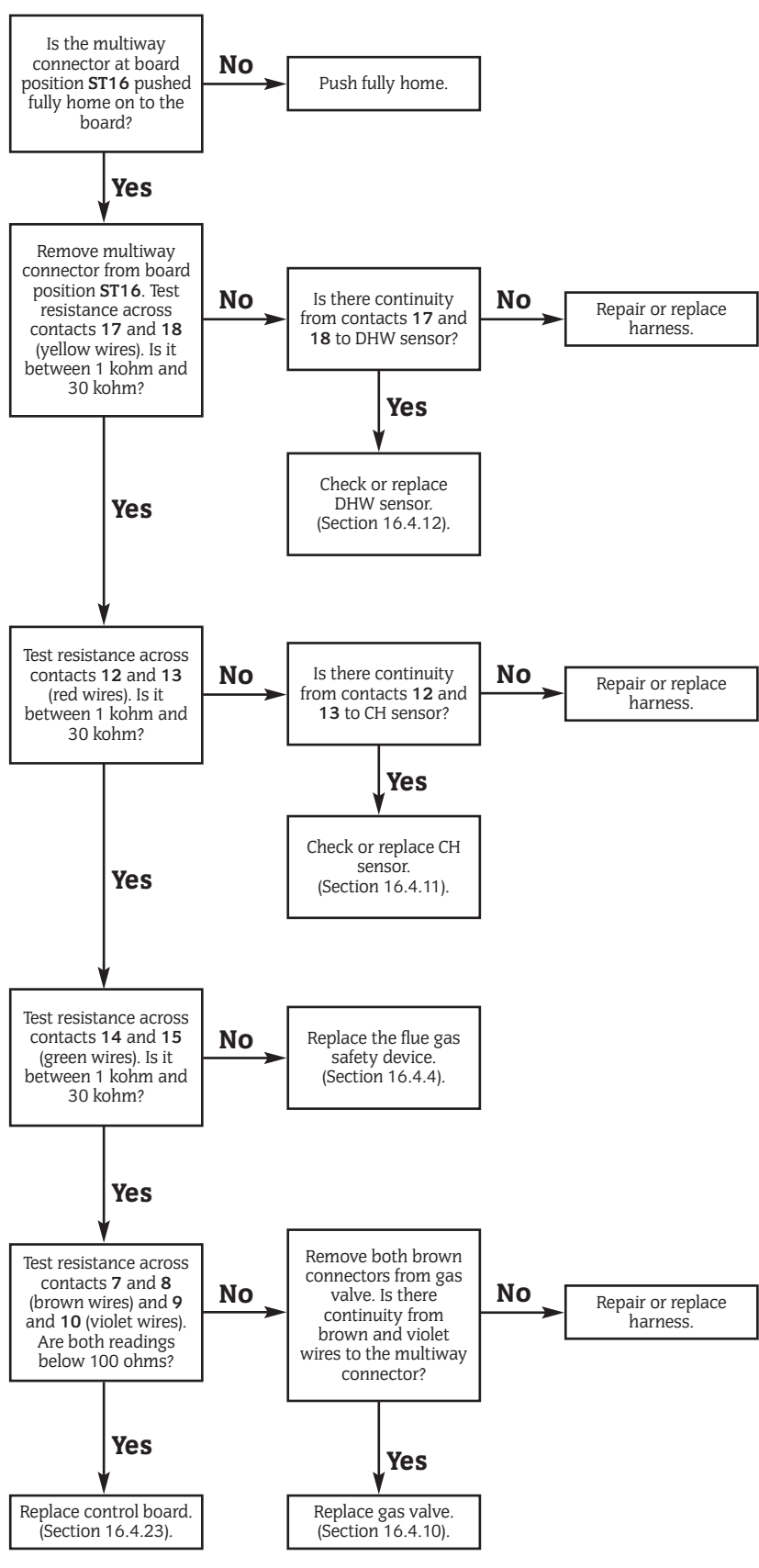


**FAIL POINT H "Burner Lockout"**

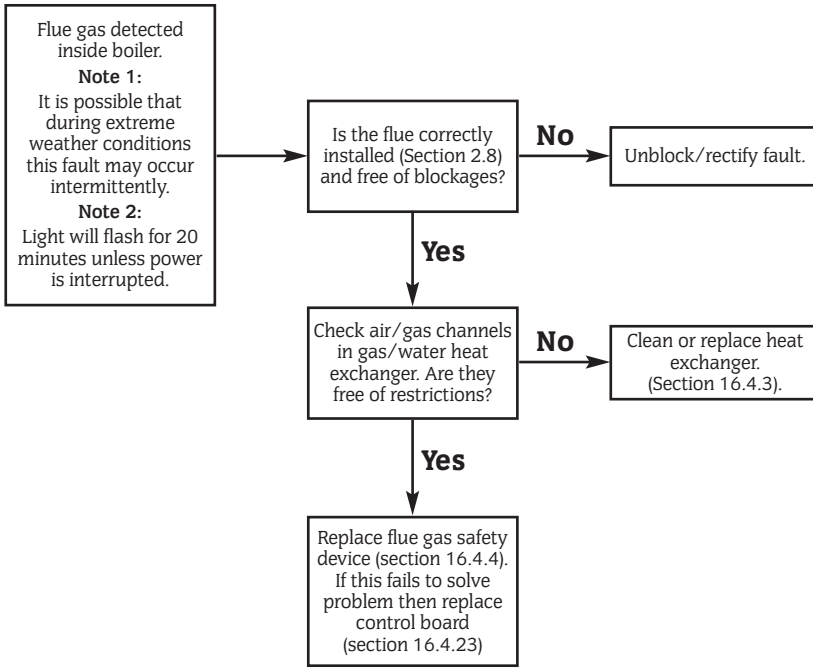




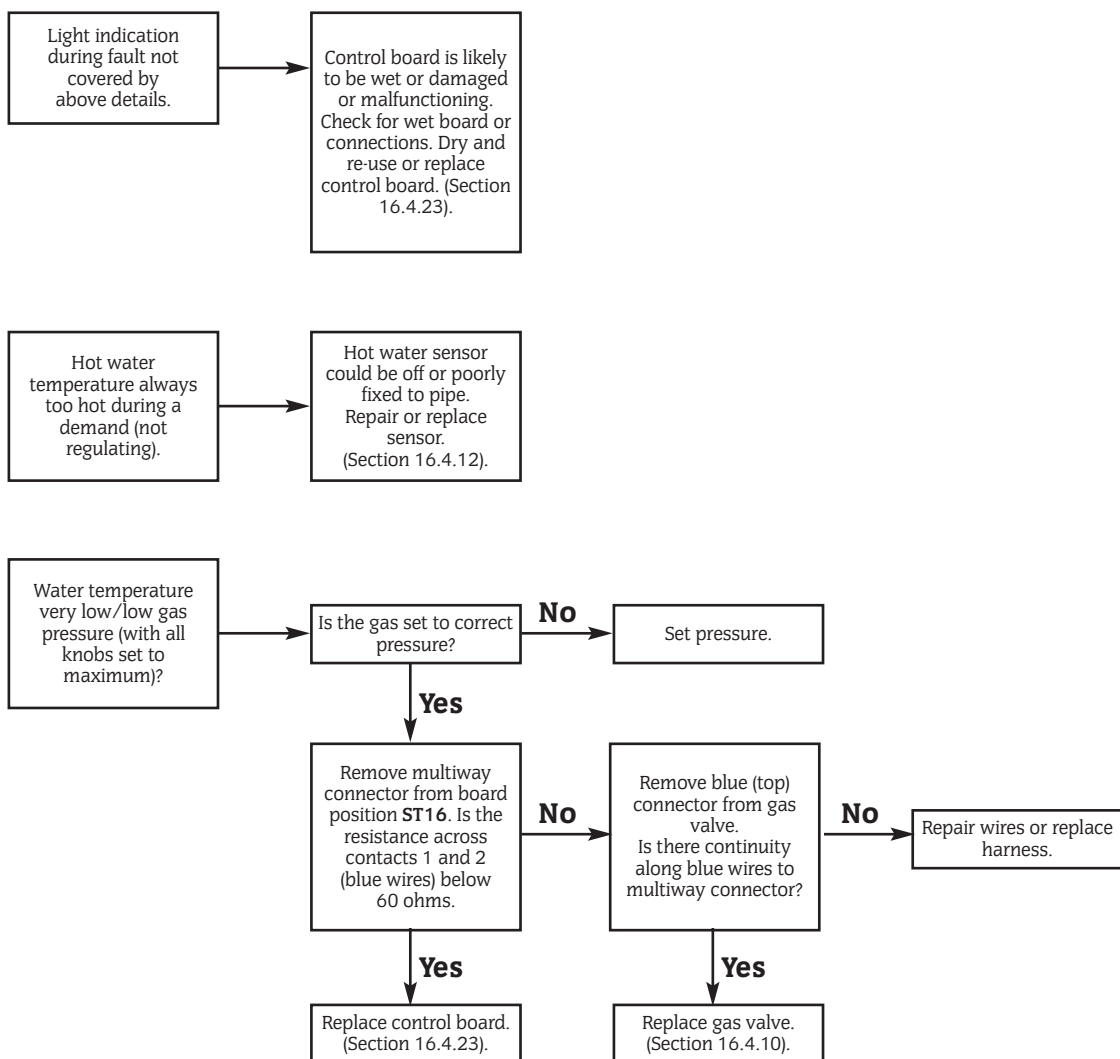
**FAIL POINT I "Sensor Fault:"**



**FAIL POINT J "Flue Spillage Fault"**



**FAIL POINT K**



## 20. Conversion Instructions

**ONLY COMPONENTS SUPPLIED BY WORCESTER HEAT SYSTEMS SHOULD BE USED.**

**ONLY COMPETENT PERSONNEL SHOULD ATTEMPT THE CONVERSION.**

**CONVERSION FROM NATURAL GAS TO LPG SHOULD NOT BE CARRIED OUT ON APPLIANCES INSTALLED IN A ROOM OR INTERNAL SPACE BELOW GROUND LEVEL**

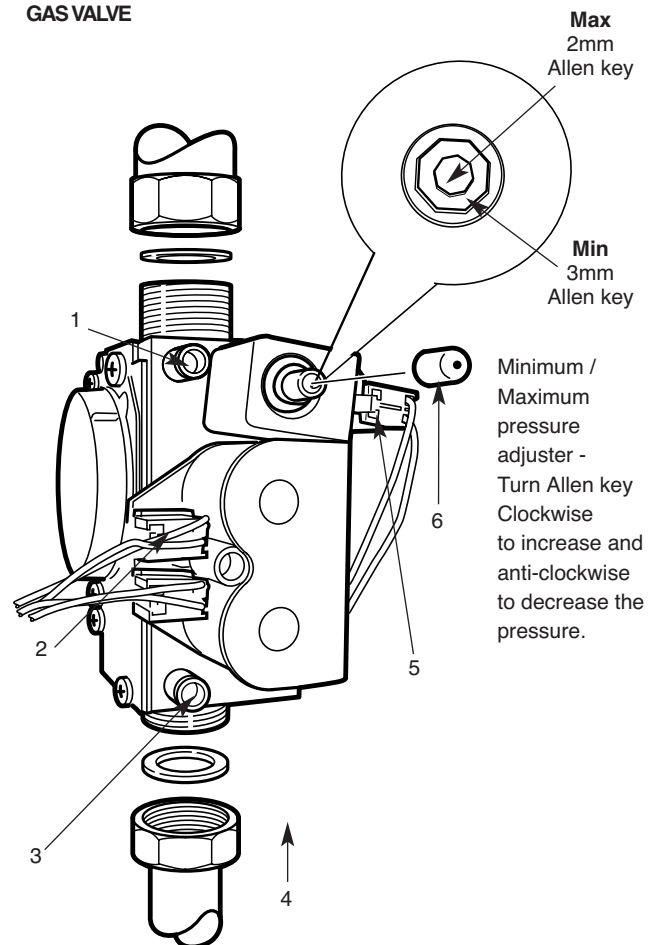
Conversion Kit LPG to NG	7 716 192 307
Conversion Kit NG to LPG	7 716 192 308

1. Ensure the gas service cock is turned **OFF** and the electrical supply is **ISOLATED**.
2. Refer to the Servicing Instructions to remove the cabinet front panel and inner casing.
3. Follow the dismantling instructions to remove the burner. Refer to Section: Inspection and Servicing.
4. Remove the injector and replace with the relevant injector from the kit. Refer to Section: Inspection and Servicing.
5. Remove the nut, end cap and bracket at the opposite end of the burner. If the conversion is LPG to NG it is necessary to remove the gauze. If the conversion is NG to LPG it is necessary to fit the gauze supplied in the kit.
6. Refit the end cap ensuring that the support bracket is in the correct orientation.
7. Remove the gas valve and replace with the gas valve supplied in the kit. Refer to Section: Replacement of Parts.
8. Re-assemble the burner and inner casing.
9. Turn on the gas and electricity supplies and follow the commissioning procedure to confirm gas soundness and correct boiler operation.
10. Check and adjust the setting pressures to the values in the table below and adjust if necessary. Refer also to the Installation and Service Instructions Section: Replacement of Parts "To Set the Burner Pressure".
11. Refit the plastic sealing cap to the gas valve modulating valve adjuster and seal with a dab of paint or similar.
12. Turn off the boiler and when cool peel off the arrow from the data plate on the combustion chamber front panel and re-stick against the gas type for which the boiler has been converted and adjusted.
13. Replace the boiler front panel.

**The conversion is now complete.**

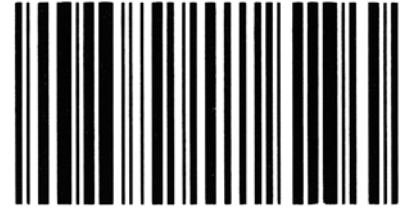
NOMINAL BOILER RATINGS (10 Minutes After Lighting)			
BOILER ADJUSTED FOR G20 (Natural Gas)			
INPUT (Net)		BURNER SETTING PRESSURE	
kW	Btu/h	m bar.	in. wg.
10.4 DHW	35,500	2.0	0.8
13.8 CH	47,100	3.5	1.4
27.0 MAX	92,100	13.2	5.3
BOILER ADJUSTED FOR G31 (Propane)			
10.4 DHW	35,500	5.5	2.2
13.8 CH	47,100	7.2	2.9
27.0 MAX	92,100	35.5	14.4

### GAS VALVE



1. Burner pressure test point
2. Main gas valve connections
3. Inlet pressure test point
4. Gas valve bracket
5. Electrical connections modulator (Blue:Blue)
6. Gas valve sealing cap

This manual is to be used in conjunction with the variant part number of the bar code below:



8716120249



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Technical Helpline 08705 266241.*

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